AMERICAN DYESTUFF REPORTER

"Circulated Everywhere Dyestuffs Are Used"

Published by Howes Publishing Company, 90 William Street, New York

Devoted to the practical application of dyestuffs in all industries; especially to textile chemistry—the science and practice of scouring, bleaching, dyeing and finishing.

VOL. XVII NEW YORK, DECEMBER 24, 1928 No. 22

Bleaching, Dyeing and Finishing, Modernized

A Résumé of Machinery and Motor Equipment in the Harman Bleachery Company, Philadelphia, Pa.

By THOMAS B. EVERIST

Harman Bleachery Company

ONE of the most fascinating histories of industrial development is to be found in the evolution of the textile bleaching and finishing industry.

In order that we may more fully appreciate the modern methods of finishing we will, very briefly, scan the methods of the ancients and follow them through to the latter part of the eighteenth century and the early part of the nineteenth, as the most notable of all the changes in the industry were taking place in that period.

It is claimed by Chinese historians that their ancestors were engaged in the manufacture and bleaching of cotton goods as far back as 2,300 B. C. Herodotus, however, gives us the first allusion of the then western world regarding the wearing of cotton clothing in 445 B. C. Recent excavations in Pompeii present the most interesting data for the comparison with a modern bleachery Here were a series of marble troughs, with piped connections in which the cloth was washed in solutions made alkaline by the addition of the ashes of various plants, the most common of which was seaweed. After repeated washings, the cloth was taken to the dying frame which consisted of a large hemispherical framework, and this was placed over a bowl of glowing coals in order that the drying operation would be hastened. In some instances the cloth would be rubbed vigorously with smooth blocks of wood in order to impart a finished lustre to it.

Bleaching was also accomplished by exposing the cloth to the action of the sun's rays, and this method held sway in Europe until the early part of the nineteenth century, when the effectiveness of chemical reactions and the introduction of steam for drying and power purpose contributed its important part to the development of the industry. The use of steam as a direct prime mover during the last decade has given place to the more efficient and cleaner method of direct electric motor drives, equipped with automatic controls.*

Bleaching By Motor-Driven Equipment

Cotton piece goods, when received in the bleachery, consists of 85 to 80% of pure cellulose and the balance is composed of waxes, starch, pectin and traces of various other impurities, all of which must be removed in order to give the cloth a pure white and properly "bottom" it for the subsequent dyeing and finishing operations. The removal of these impurities is the task of the bleachery, and we will now proceed to follow in detail each process through which the cloth passes.

Upon their receipt, the bales are checked and the cuts of grey cloth laid out in piles and the ends of the adjacent pieces are sewed together. In some cases, this single run or lot of cloth will exceed thirty miles in length.

The first machine operation is that of singeing which takes place on the machine shown in Fig. 1.

The cloth enters the singer at the far end, and is directed by means of various rollers, across six gas flames, in order that the fuzz and lint may be burned off. Directly behind the last burner is the immersion box, where the cloth is quenched in water and squeezed out. The high reactance squirrel cage motor "A" is rated at 10 horsepower, two phase, and is controlled at the push-buttom station "E." The motor pinion "B" drives a variable speed device, which in turn drives the singer at various speeds, depending on the grade of cloth in process. The

*It is to be noted that all of the motors driving the various machines mentioned in this article were manufactured by the General Electric Company and are equipped with pushbuttons which control the magnetic switches for each individual motor.

compressor "C" is used in the air-gas mixture and is driven by the 1-horsepower squirrel-cage motor shown at "D."

Next follows the kier boiling operation, where the cloth is subjected to the action of alkaline liquors for the purpose of saponifying the waxes and fats and loosening the seed particles, etc., that are in the cloth. This operation extends over a period of eight to twelve hours, during which time the liquor is circulated by a centrifugal pump, direct connected to a 2-horsepower squirrel-cage motor, which has been so constructed as to be resistant to steam vapor and corrosive fumes. Fig. 2 illustrates a low pressure kier and the motor-driven pump, which is used to draw the liquor from the base of the kier and spray it on to the top.

At the completion of the boil, the cloth is then ready

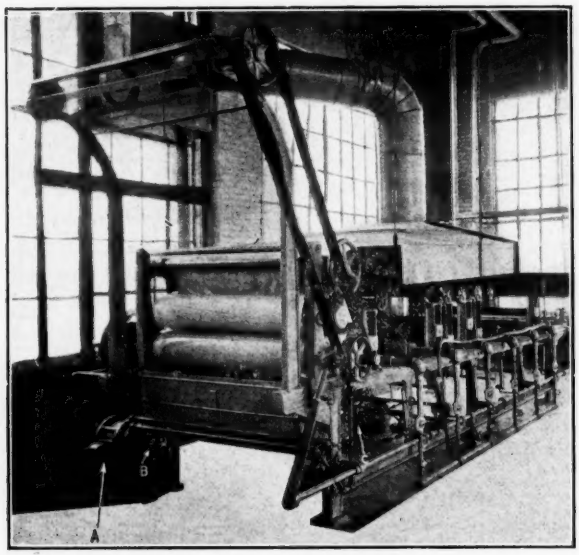

FIG. 1—*Singeing Machine "A," for Gray Goods, at Harman Bleachery Company, Philadelphia*

for the actual bleaching process which is shown in Fig. 3. The cloth is drawn from a kier to the washing machine "B" which removes the residual matter remaining from the kier boil. Then it is passed through a bleaching solution of sodium hypochlorite and this reacts with the coloring matter in the cloth.

THE WASHING EQUIPMENT

After a varying length of time, the cloth is transformed into an almost perfect white. It then passes into the washing machine "G," and then through a weak acid solution, or anticholor, to neutralize any of the bleach liquor that may remain in the cloth. This is followed by the final wash, as shown in "H." Both washers, "G" and "H," are driven by motors "E" and "F" respectively. The first washer, "B," is driven by a 25-horsepower, high-reactance, squirrel-cage motor and one of the control stations is shown at "A."

High-reactance, squirrel-cage, 20-horsepower motors "E" and "F" drive washers "G" and "H" respectively. When the final wash is complete, the cloth is rigidly inspected by chemical indicators to detect the possible presence of chlorine or acid in the cloth, either of which would be very detrimental if allowed to dry in the cloth.

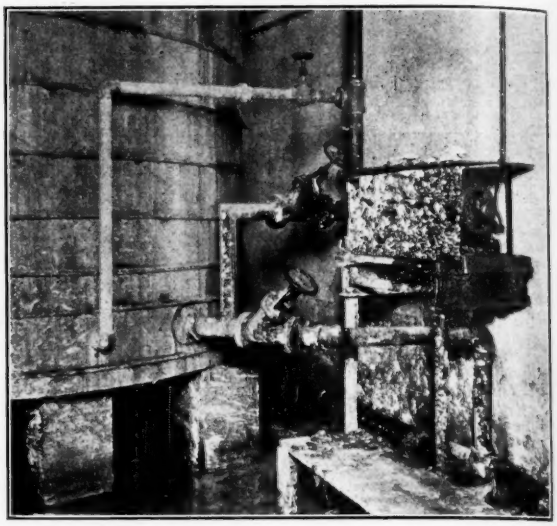

FIG. 2

The entire bleaching range is tied in with a master control circuit which enables an operator to stop all of the motors by pressing any of the master control buttons that are situated at every control box. This facilitates operations and results also in reducing the damages that may occur due to breaks in the cloth.

The actual bleaching process is finished when the cloth is piled in the white bins. It there awaits the drawing-out or mangling operation. The water mangle shown in Fig. 4 operates in conjunction with the scutcher, which is a device consisting of beater bars and scrimp rollers that force the cloth from the rope

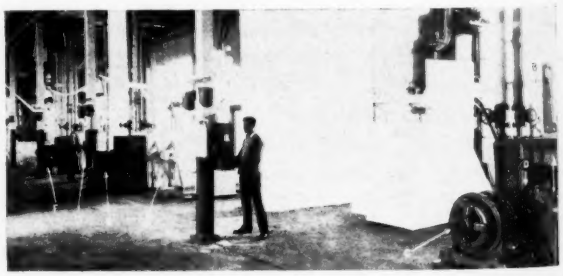

FIG. 3—*Bleach House, Showing Push-Button Control Station for Motor Driving Washer and Squeezer Through Gears, and for Driving Washing Machines*

form to its full normal width. Immediately after that operation, the cloth passes through the squeezing rolls of the water mangle and the excess moisture is removed. Here it is folded down in trucks and awaits the drying operation.

The water mangle and scutcher are driven by the 25-horsepower, high-reactance, squirrel-cage motor shown at "A," geared to the driving roll of the mangle by means of the pinions "C" and "D." "B" is a start, stop and jog control station for the driving motor.

From this point, the cloth may be given any one of a number of finishes. It may be backfilled, dyed, starched, printed or merely be given a plain finish. The backfilling operation consists of forcing a heavy

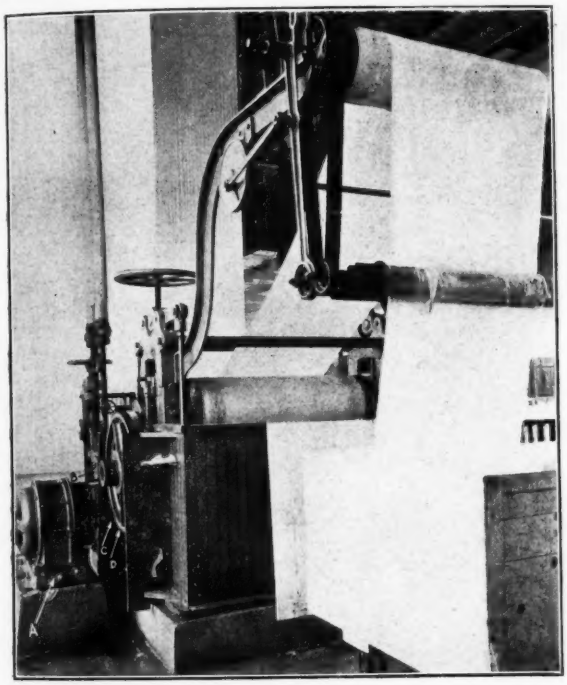

FIG. 4—*Water Mangle "C," Showing Induction Motor (a) Connected to Mangle by Pinion (c) and Gear (d) and Control Station (b)*

preparation of size into the cloth. This is accomplished on the machine shown in Fig. 5 (usually called a "Tommy Dodd") and is driven by the 10-horsepower, high-reactance, squirrel-cage motor.

Having passed through this machine, the cloth is ready for the tentering operation, which will be discussed in a later paragraph.

DYEING AND TENTERING

If the cloth is to be dyed, it is taken from the water mangle to the drying cans. After drying, it is passed through the dye pad which takes the cloth in its full

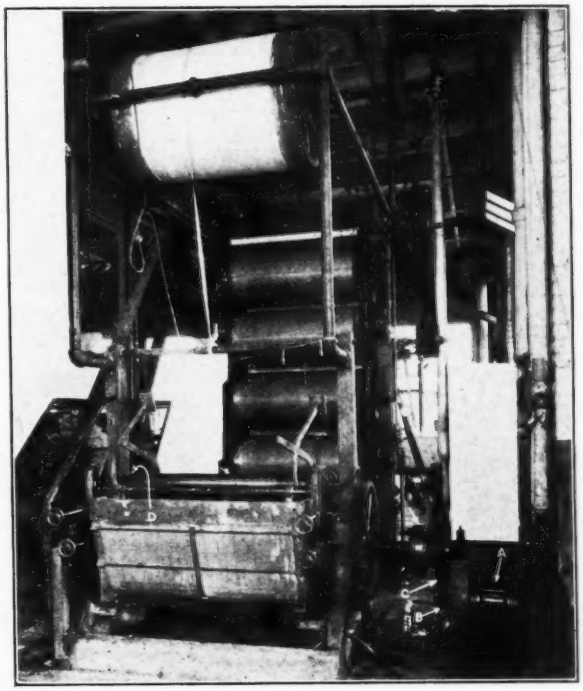

FIG. 5—*Cloth Backfilling Machine "D"*

width through the dye liquor and squeezes the excess of liquor from the cloth. This machine is shown in Fig. 6. The motor is connected to a Reeves Variator by means of a link-belt drive ("G"), and this in turn is direct geared to the dyeing machine. The start, jog and stop buttons are shown at "D."

The tentering operation, which is drying to an exact width, follows the dyeing, backfilling or pure

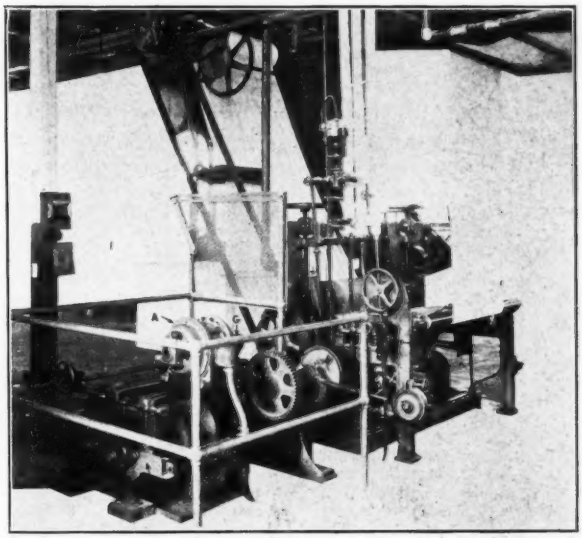

FIG. 6—*Cloth-Dyeing Machine "E" at the Harman Bleachery*

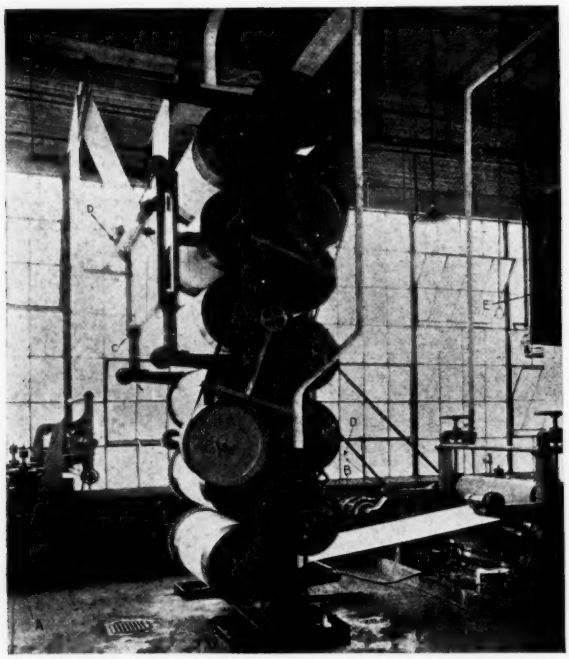

FIG. 7—*Starch Mangle, Drying Cans and Tenter "F"; Push-Button Control Station at A*

starching. This machine consists of three integral parts:

1. The starch mangle shown at the right hand side of Fig. 7.
2. Drying cans.
3. The tenter frame proper, sprinkler and winder (shown in Fig. 8).

The main driving motor is a 3-phase, 20-horsepower shunt-characteristic commutator a-c. motor with a three-to-one speed variation, a comparatively recent development and actually adjustable entirely by the brush relationship, independent of any rheostats or variable resistance units.

The speed is changed by the operator pressing either the fast or slow button on the control stations shown in Fig. 8 at points "A" or "D." These buttons actuate the small reversible pilot motor which is direct connected to the train of gears. The brushes are mounted on shiftable frames which are connected to the gears and for every rotation of the pilot motor there is a very minute change in the brush relation, thereby increasing or decreasing the speed of the driving motor. The speed change thus obtained is almost instantaneous and can be controlled to a fraction of a yard per minute between the range of 20 to 105 yards per minute.

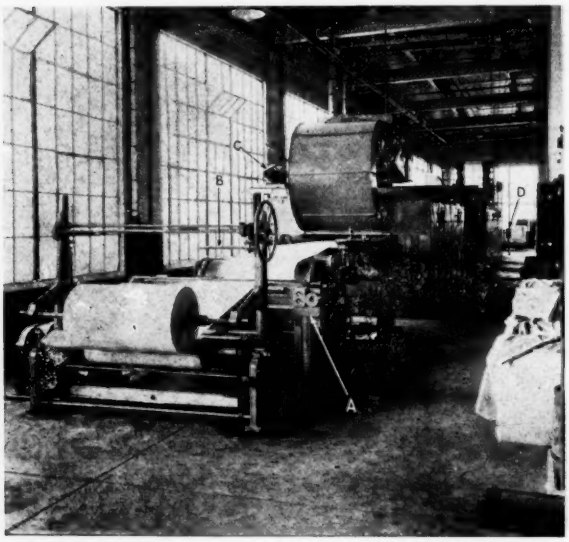

FIG. 8—*Tentering Frame "G"*

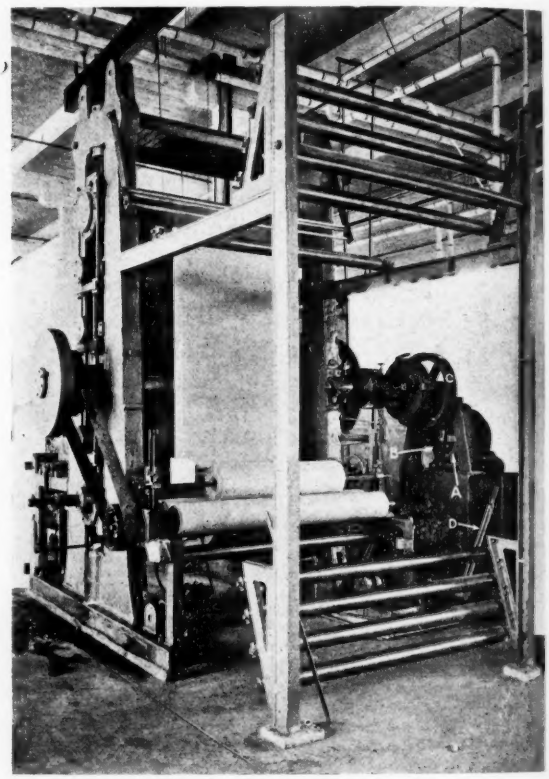

FIG. 9—*Textile Calender at Harman Bleachery Company, Showing Induction Motor (a), Pinion (b), Gear (c) and Clutch-Lever (d)*

There is a 7½ horsepower, adjustable-speed, a-c. motor for driving the starch mangle and drying cans shown in Fig. 7, the motor "B." It is of primary importance that the speed of this motor be constantly synchronized with the 20-horsepower, adjustable speed motor. This is secured by the vertical motion

(*Concluded on page* 849)

Proceedings of the American Association of Textile Chemists and Colorists

The American Association of Textile Chemists and Colorists

President
E. H. KILLHEFFER
Newport Chemical Works, Passaic, N. J.

Vice-Presidents
WALTER S. WILLIAMS—P. J. WOOD

Secretary
ALEX MORRISON
5 Canterbury Street, Andover, Mass.

Treasurer
WINTHROP C. DURFEE
516 Atlantic Avenue, Boston, Mass

Councilors
RALPH F. CULVER — GEORGE A. MORAN
B. F. PHETTEPLACE — HUGH CHRISTISON
WILLIAM R. MOORHOUSE — WALTER M. SCOTT

Past President and Chairman of the Research Committee
LOUIS A. OLNEY
Lowell Textile Institute, Lowell, Mass.

LOCAL SECTIONS AND THEIR OFFICERS

Northern New England Section—
William H. Cady, Chairman, Pacific Mills, Lawrence, Mass.
Harold C. Chapin, Secretary, Lowell Textile Institute, Lowell, Mass

Rhode Island Section—
John Hutton, Chairman, Glenlyon Print Works, Phillipsdale, R. I.
Albro N. Dana, Secretary, Franklin Process Co., Providence, R. I.

New York Section—
Daniel P. Knowland, Chairman, Geigy Company, N. Y. City.
Philip H. Stott, Secretary, Newport Chemical Works, Inc., Passaic, N. J.

Philadelphia Section—
Elmer C. Bertolet, Chairman, Philadelphia Textile School, Philadelphia, Pa.
Percival Theel, Secretary, Philadelphia Textile School, Philadelphia, Pa.

Piedmont Section—
Prof. Chas. E. Mullin, Chairman, Clemson College, Clemson, S. C.
Thomas J. Nuckolls, Secretary, Greenville, S. C.

South-Central Section—
P. F. O'Neill, Chairman, Standard-Coosa-Thatcher Co., Chattanooga, Tenn.
J. Baynard Smith, Secretary, Chattanooga, Tenn.

Lowell Textile Junior Section—
John V. Killheffer, Chairman; Earl W. McLean, Secretary.

THE EIGHTH ANNUAL MEETING

THE Providence Section of the Association won the hearty admiration of three hundred and more members who attended the Eighth Annual Meeting held at the Biltmore Hotel, Providence, on Friday and Saturday, December 7 and 8. The sentiment seemed unanimous that despite the somewhat smaller attendance than last year, the Eighth Annual Meeting will undoubtedly go on record as among the most important as well as one of the liveliest and most enjoyable of those held.

Both the technical program and the entertainment features were carefully arranged well in advance with the aim of making every hour of the meeting yield sixty minutes worth of value to those who came to Providence. Two successful features of last year's meeting were incorporated into the general program: the system of timing all papers and discussions in order to expedite the schedule of each session, and the very popular feature of the Open Forum on Friday evening.

Meetings of the Council of the Association and of the Research Committee were held Friday afternoon at the Biltmore Hotel. The report of the Research Committee meeting is published in this issue.

The Open Forum held on Friday evening, presided over by Vice-President Walter S. William, officially opened the main program and was heavily attended. The following technical papers were delivered, supplemented by lengthy discussions.

Solvents in Soap—By R. W. Jaeger of Armour Soap Works.

Treatment of Wool with Active Chlorine in an Organic Carrier—By G. L. Armour, American Aniline Products, Inc.

Cellulose and Its Importance to Textile Industry—By Dr. John E. Jackson, consulting research chemist.

The Forum was further enlivened through the judicious use of entertainment staged during the intervals between the reading of the papers.

The meeting room where the Saturday Morning session was held was crowded to capacity and opened with the paper by A. R. Thompson which had not been delivered at the Forum. The following papers were presented at this session:

New Method for Bleaching and Mercerizing Cotton Piece Goods Containing Vat and Sulphur Colors—By A. R. Thompson, Rohm & Haas Company.

Dehydrating and Drying in Some Manufacturing Processes—By M. L. Griffin, Chemical Engineer.

The Bleaching of Textiles with Hydrogen Peroxide by H. G. Smolens, Buffalo Electro Chemical Company.

Cross-Sectioning of Textiles—By Arthur K. Johnson, Cheney Bros.

Manufacture of Rubberized Cloth and Attendant Dyed Cloth Problems—By S. G. Byam, E. I. du Pont de Nemours & Co.

Application of Indigosols In Printing—By W. H. Cotton, General Dyestuff Corporation.

At the business meeting held during the Saturday morning session, at which President E. H. Killheffer presided, the election of officers was held, action was taken on amendments to the constitution, prizes were awarded for the best papers published in the Proceedings during the year and annual reports were presented by the Secretary and the Treasurer and by Dr. Olney as Chairman of the Research Committee. The chairmen of the various sub-committees then reported upon the progress of the research work undertaken by their respective groups, and William D. Appel spoke on the operation of the Launder-Ometer. A complete report of this business meeting follows the report of the Open Forum, published below.

The Saturday afternoon session concluded the business meeting and continued with a very full technical program and discussion of papers. The following papers were delivered:

Potash or Soaps—Which?—By W. N. Bray, Procter & Gamble.

The Problem of Testing Textile Merchandise for the Retail Merchant—By Frank Stutz, Better Fabrics Testing Bureau.

Shrinkage of Cotton Cloth—By H. D. Clayton, Cluet, Peabody & Co., Inc.

Problems in Dyeing Sulphur Blues—By Walter F. Haskell, Dana Warp Mills.

Color Science Applied to Textiles—By Dr. Walter M. Scott, Munsell Color Company, Inc.

The Effect of pH in Scouring and Dyeing Rayon Upon the Resulting Shades—By Prof. Charles E. Mullin of Clemson College.

Some Dyeing and Dyers of the South—By Prof. Albert H. Grimshaw, North Carolina State College.

Considerably more than three hundred members gathered in the grand ballroom of the Biltmore Hotel for the Eighth Annual Dinner. P. J. Wood, presiding as toastmaster, ably excelled his previous records in that capacity and gained a deserving share of the applause. He introduced in turn Mayor James E. Dunne of Providence, who welcomed the assembled members in the name of his city; Richard Watrous, secretary of the Chamber of Commerce of Providence; President Killheffer, and past-president Dr. Louis A. Olney, both of whom made brief but cogent addresses; and the two entertainers, Goeffry O'Hara and Malcolm MacGregor. Music was furnished during the dinner by the Moonlight Serenaders, a string quartet.

[EDITOR'S NOTE: *The report of the Open Forum, with the technical papers delivered there, the report of the Saturday morning business session and the complete report of the annual dinner are published herewith. The remainder of the Saturday morning session and the complete Saturday afternoon session, with the papers delivered and a report of the subsequent discussion, have been held for a later issue, owing to the necessity of more careful editing of the technical reports.*]

OPEN FORUM SESSION

Friday Evening, December 7, 1928

The Open Forum Session of the Eighth Annual Meeting was called to order at 8:30 o'clock in the Biltmore Hotel, Providence, by Dr. E. H. Killheffer, President of the Association.

President Killheffer—Gentlemen, the meeting will come to order. We are right on time. (Laughter.)

There were two reasons why we didn't start exactly at 7:30. One was that the Vice-President, whom I asked to preside tonight, was hungry and he insisted on finishing whatever he had to eat. (Laughter.) The other reason was we figured that if we waited until 8:30 we would be just in time for some entertainment. It is 8:30 now, so that apparently there is entertainment due.

We are mighty glad to welcome so many of you to this, our Eighth Annual Meeting, and we hope that besides smelling like smoked herrings when you leave this room, you will get something of profit while you are here.

I have asked your senior Vice-President, Mr. Williams, to preside this evening, which I am sure he is glad to do. I want to introduce him to you and turn this meeting over to him. Mr. Williams! (Applause.)

. . . Walter S. Williams, Vice-President of the Association, took the chair.

President Killheffer—One change has been made in our program, by the way, and that is that the paper which was to have been presented at 7:30 tonight will be presented at 9:45 tomorrow morning, instead. In that way, we will almost catch up on the program.

Chairman Williams—You all know your President, Dr. Killheffer, so you can imagine who it was that held up the meeting so that he could finish his dinner. I will leave it to you to judge from the appearance of his figure and the appearance of mine which one of us it was. (Laughter.)

The first paper being omitted, we will start with the second paper, "Solvents in Soap," by R. W. Jaeger, of the Armour Soap Works. (Applause.)

R. W. Jaeger—Mr. Vice-President, Mr. President, Ladies, Gentlemen, Fellow-Members of the American Association of Textile Chemists and Colorists: To those of you who were at the fall meeting of the American Chemical Society at Swampscott last September I have a confession to make. In fact, I must ask your pardon if some of the material which I delivered in a paper that I presented at that time on solvents is contained in the paper I am to read this evening.

. . . Mr. Jaeger then presented his prepared paper:

Solvents in Soap and Their Subsequent Affect on the Properties of Soap Solution

By Robert W. Jaeger

Armour Soap Works, Chicago, Ill., and North Bergen, N. J.

MUCH has appeared in the literature within the past few years, particularly that from foreign sources, on the relative advantages of various soap and solvent mixtures as compounds to be used for the scouring of textile fabrics. A true nomenclature for such mixtures seems vague in view of the fact that some of these so-called solvents are only soluble in soap stock fatty acids, others are water-soluble, a third group soluble in all proportions in both, and still another grouping that have a limited solubility in soap solutions. In one or another of these several classifications we may find acetone, benzol, carbon tetrachloride, turpentine, toluol, trichlorethylene, solvent naphtha, fusel oil and several hydrogenated hydrogenated hydrocarbons.

Into this latter classification may be considered those belonging to the so-called cycloparaffin series of compounds. In this group we have two very important alcohols which are also typical examples of this class of solvents. The first of these is the compound ($C_6H_{11}OH$) hexaline, derived from carbolic acid by Sabatier's hydrogenation process, which has revolutionized the oil industry by making possible the conversion of unstable oils into hard stable fats. A closely related compound, $CH_3C_6H_{10}OH$, or methylhexaline, is made by the same hydrogenation process from commercial cresol. These substances are manufactured in Germany and England, and are now being made in this country in extensive quantities.

Quite similar in composition to hexaline and methylhexaline are natural mixtures containing alcohols related chemically to turpentine. The most readily available of such mixtures is commercial pine oil of questionable composition (containing fenchyl alcohol, also several sequiterpens 1½ mols.). The pine oil itself, and likewise commercial terpineol, separated from pine oil or synthesized from turpentine, shows the typical behavior of soap-soluble fats solvents.

By mixing any of the above soap-soluble liquids with oil solvents soluble in water, the number of soap-soluble oil solvents can be almost indefinitely increased. Some mixtures made in high concentration, however, do not withstand dilution with water to any great extent, but assume the form of a milky emulsion as the mixture is diluted. These emulsions are reasonably stable, but as dilution proceeds the part of the solvent which is insoluble in the soap solution of attained concentration begins to separate out in the form of an oily layer.

Experimental

Our experiments were confined to the use of hexaline, methylhexaline and commercial pine oil and only the function that these materials have in an experimental scouring system. These compounds all have a decided advantage in the wetting out of fabric, and act as very potent carriers for the intimate dispersion of mineral oil or such materials to all parts of a tank, bowl or kettle.

The question of incorporating these solvents into soda base soaps was quickly disposed of. It was found that when the stock and solvent were added to the kettle together and "killed," a large amount of solvent was lost in the lye, niger, caustic changes, salt washes, and also driven off during the boiling. Attempts to incorporate solvent directly into kettle soap by means of crutching met with considerable difficulty in crutching to a uniform distribution, due to solubility of soap. Attempts to dry these solvents in chip form or frame into a bar were futile. With potash cold-made soaps, results were much more satisfactory. This form, although yielding gels of fairly high viscosity, proved the most satisfactory method of combination. A small spiral crutch of 60-pound charge, being available, was used for investigational work.

With regard to the amounts of solvents practical to use in a soft soap, it was found that very good potash soap gels resulted from 60 to 70% anhydrous soap content, titer 24° C., containing, in addition, 5 to 15% of single or mixed solvent concentration. It was impractical to extend beyond this amount of soap and solvent and yet carry a sufficiently high soap content, due to the incorporation of moisture necessary to dissolve the solid caustic potash, the cost preventing the use of additional solvents. As the amount of solvent was increased, the consistency of the resultant soaps were thinned in proportion. It was also found that smaller amounts of solvent facilitated increased soil removal, which was quite contrary to our expectations. Also that a mixture of two solvents had a superiority over either one alone.

The sudsing power of soap first makes its appearance in the fatty acid series with caproic acid ($C_6H_{11}COOH$),

which suds at 2 mol. concentration. The sudsing increases rapidly with increased mol. weight up to 17-18 carbon atoms, then decreases owing to insolubility.

There is as yet some divergence of opinion concerning the sub-microscopic structure of solid soap. According to McBain, all transparent soaps are true elastic gels composed of micelle, and non-transparent soaps are gels containing more or less curd fibers. The curd fibers have semi-crystalline structures.

One-half gram of each soap was shaken in a 4-ounce oil bottle with 60 c.c. of water. Up to 3% of additional solvent there was no depreciation of foaming quality. Very little change was noted in amount of suds at 5%, while above this amount it could be easily noted in proportion to the additions made. In small amounts less than 3% there was no difference noticeable between the different solvents used.

Basing our experiments on a 70% potash fatty acid (stock of cottonseed origin), it was found that the presence of two solvents favors the formation of clearer gels over that possible to attain when only one of the solvents was used. It was not determined if this is due to the solution of one solvent in another and the resultant more soluble in soap.

Constituents of Soap Solutions.—According to the latest investigation, there are, apart from chemical differences, several types of particles present in a soap solution:

1. Single ions (negative—palmitate cleate; positive—Na, K).
2. Undissociated molecules: NaP, NaOl.
3. Micelle formed of aggregate of negative ions.
4. Colloidal particles composed of groups of undissociated molecules.

1A. The proportion of single ions is greater:
- (a) At higher temperature.
- (b) At greater dilution.
- (c) With fatty acid soaps of lower molecular weight.

(Solvents are considered an addition to the bath as leaning toward the fatty molecule.)

2A. The proportion of undissociated molecules is increased by the addition of salts having a common ion with the soap.

3A. The percentage of micelle is greater:
- (a) Ion mixtures of several soaps.
- (b) At greater concentrations.
- (c) At lower temperatures.
- (d) With soaps of higher fatty acids.

4A. Colloidal particles are present and increased by:
- (a) Greater concentration.
- (b) In presence of sodium hydroxide and ether electrolytes.
- (c) And to a slightly lessened extent in the presence of solvents.

Surface Tension

The concept of surface tension plays an important part in the theory of colloids. Although there has been some dispute concerning its value as an index to the foaming power of a soap solution, there can be no doubt that it plays an important part in foaming and detergent action.

1. The surface tension effect is greater for the fatty acids with larger number of C atoms, provided this is not offset by their slight solubility in water.

2. The surface tension lowering varies with temperature, and the order of activity of a series of soaps is not the same at all temperatures.

3. Mixtures of soaps may produce a surface tension lowering greater or less than that of the pure constituents.

4. Mixtures of soaps and solvents in low concentration have about the same value as similar soaps not containing any solvent. At higher concentrations their lowering is slightly less.

In following the procedure for carbon-black number determinations as outlined by McBain, it was found that the foaming of the sudsing quality of all of the samples was reduced in proportion to the actual amount of solvent present, and that a similar ratio existed between the actual amount of carbon black carried through the paper. No definite readings were made on the filtered solutions.

As it is quite commonly agreed that the valuation of

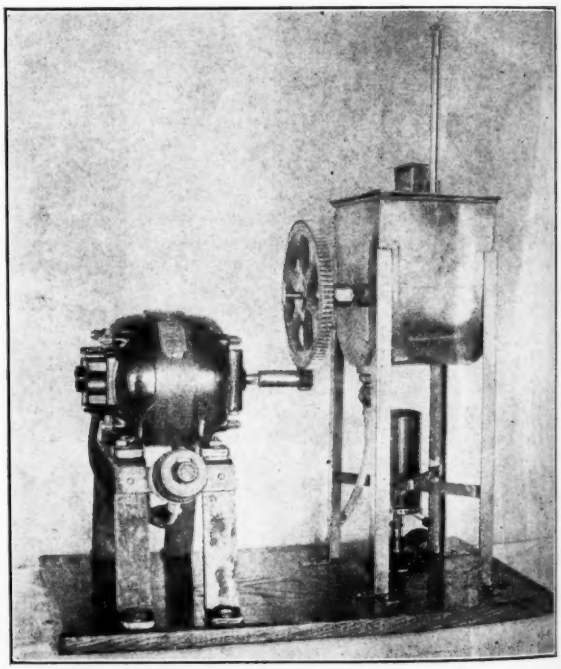

Fig. 1

one or the comparison of several different detergent agents cannot be determined accurately and properly by such criteria as suds, lathering properties, carbon-black numbers, surface-tension measurements, and such, it was decided to attempt a series of washing tests under similar conditions on the same material with the various samples under consideration. For this we resorted to the use of a small laboratory washing machine and a procedure based on a modification of the method proposed, though not adopted, by the American Oil Chemists Society's Committee on the Evaluation of Detergents. A bronze washing machine of approximately the following dimensions was used: Length, 6 inches; width, 5 inches; maximum depth, 7½ inches (rounded bottom); fitted with tight cover, thermometer, and petcock; containing a wash reel of brass about 4 inches long and 3½ inches in diameter; driven at a speed of 235 r.p.m. (See Fig. 1.) The reel is made of two solid round-end pieces connected by stiff wires and provided with hook-like prongs, to which the cloth is fastened after being wrapped around.

Small strips of white woolen flannel 12 by 4 inches in size were prepared. After being dry-cleaned in ether, these were marked, dried and weighed in conditioning oven. Soiling was facilitated while they were stretched firmly between the hands and completely immersed in a shallow dish containing a solid solution made up as follows: 40 grams ceresin, 40 grams lanolin, 60 grams cylinder oil, 50 grams roofing tar. (Of this, 20 grams was rejected as insoluble.) These were all mascerated with carbon tetrachloride and made up to 2 liters volume. This soiled fabric was recorded as grease weight and the increase figured on a 1-gram basis. Soaps were made up to 0.54% concentration (70% anhydrous basis).

The pH of all soap samples at 0.54% concentration (5.4 grams soap "as is" per liter) was found to be 10.7 to 11.0, averaging 10.8 determinations with Alizarine Yellow R.

Procedure

The fabric was mounted on the cage of the machine and (1 liter of) soap solution of corresponding number, at exactly 55° C., poured into the bowl. The machine was immediately started and allowed to run for exactly five minutes, whereupon it was stopped, a second and a third washing were followed, whereupon the petcock opened, and given one minute to drain. One liter of tap water at 26° C. was added and the sample run in this for exactly one minute. A one-minute drain followed. This rinsing operation was repeated a second and a third time, following which the sample was removed, hung up, dried and again weighed as scoured weight. Chicago city tap water (Lake Michigan) was used in all soap solutions and experiments in preference to distilled water.

Although a large number of soaps were subjected to this washing test, the results of the most typical ones under consideration are tabulated below (see Fig. 2). Weights are in grams and calculations based on percentage loss of soil per gram fabric.

FIG. 2—AMOUNT OF TOTAL SOIL REMOVED.

Average of Three Sets of Scouring Experiments

Fabric weight approximately 4.2 grams.
Soil weight approximately 1.5 grams.

1	2	3	4	5	6	7
58	70%	Pure soap	4.403	0.299	0.184	61.6%
54	70%	3% Hexaline ..	4.232	0.266	0.158	59.9%
55	70%	3% Tetraline ..	4.290	0.402	0.233	58.1%
56	70%	3% Pine oil ..	4.250	0.262	0.145	55.4%
76	70%	{ 3% Hexaline .. { 2% Tetraline ..	4.280	0.382	0.202	52.8%
77	70%	{ 3% Hexaline .. { 2% Pine oil ...	4.450	0.326	0.168	51.6%
51	70%	15% Hexaline ..	4.352	0.379	0.166	43.8%
52	70%	15% Pine oil ..	4.227	0.255	0.091	35.6%
53	70%	15% Tetraline ..	4.185	0.230	0.096	41.0%

1. Experimental number of sample examined.
2. Per cent anhydrous potash soap
3. Solvent amount and type.
4. Average original weight of dry-cleaned fabric.
5. Average amount of soil per gram fabric.
6. Average loss per gram fabric.
7. Per cent loss 10/7 of soil in three washings.

Just what phase the miscible solvent is dispersed or emulsified in while in aqueous solution we were not able to establish definitely. However, by means of buffer solutions a repression of soap ironization was noted and the natural solubility of the solvent in the soap media lessened. When on dilution of the soap solution the optimum solubility point is exceeded, the solvent can be noticed to collect in microscopic globules and eventually to separate out. In concentrations of 1/10% soap and 1/14 of 1% solvent in the bath, the maximum scouring efficiency on amount of soap used on the test fabrics was noted. As a possible explanation of the mechanism of these materials we may consider that soap in aqueous solution is in true colloidal condition and serves as a medium into which and through which soils will disperse; consequently these soap-solvent mixtures can only approach true solution theoretically at infinite dilution.

Conclusions

1. The rate of boil-off is decreased in direct proportion to the solvent content when used in amounts above 7 to 10%.

2. The handle of finished material has no advantage over that scoured without solvents.

3. The sleaziness of silk-knit material is slightly increased.

4. The tendency of the soap-solvent solution to lower surface tension is somewhat retarded.

BIBLIOGRAPHY

Important among the recent bibliography on the subject of hydrogenated compounds are the following:

"Uses of Solvents in Soap"—O. R. Flynn, Textile World, July 26, 1924

"Hexaline and Methylhexaline as New Bases for Soap"—Zeitschrift Deutsche Oel & Fett Industrie," Vol. 41, 534-6 (1921).

"Preparation and Properties of Cyclohexanol and Its Application"—Dr. J. H. Frydlenden, La Reveue des Products Chemiques.

"Determination of Hexaline and Methylhexaline in Soap"—Dr. M. Jakes, Seifen Seider Zeitung, 1924. Dr. Bergo, same, Vol. 49, 416-17, 1922

"Use of Hexaline and Methylhexaline in the Preparation of Fatty Substances for Use in the Textile Industry"—Dr. Walwart, Bulletin of Public Technical Laboratory of Chemical Engineering, Vienna. Kind and Zchlack, Textilberichte, 4, 277.

Also two papers describing the properties of these solvents have been published in the "American Dyestuff Reporter" by E. H. Killheffer, May 31, 1926, and October 1, 1927; also Textile World, July 26, 1924. These and other publications can be named as current sources proposing and advancing these solvent materials as assistants for the scouring of textile materials.

Discussion of Solvents in Soaps

Chairman Williams—We have a very interesting paper, and I feel there ought to be some discussion on it.

Mr. Low (Newport Chemical Works)—I should like to ask Mr. Jaeger if those conclusions are based on repeated tests.

On wool, we have found that we couldn't get an accurate determination of how much soil was removed, on account of the hygroscopic nature of wool. We conducted such tests as you refer to some time ago, but we were never able to get repeats on them that gave us any idea that they could be considered as conclusive.

Mr. Jaeger—These sample fabrics that we worked with weighed approximately 10 grams each. The weighings were made in condition ovens, where the temperature and humidity were constant, before processing and after processing. We dry-cleaned our fabrics afterwards and approached very well—

Mr. Low—Pardon me for interrupting. You say after dry cleaning you conditioned them, and then weighed them before you started?

Mr. Jaeger—Yes.

Mr. Low—And then conditioned them again after the soiling?

Mr. Jaeger—Yes, sir, in the same condition oven.

Mr. Low—That might be wherein we failed to get the thing accurately. But did you find that on several repeated tests you got the same results?

Mr. Jaeger—These figures I quoted are the result of 3 sets of experiments, the average of 3 sets.

Mr. Harkins (Newport Chemical Works)—At the time we were running those determinations, we were using a soil medium consisting of almost the same things that yours did; ceresin, lanolin, and so on. The ceresin we used was not the serecin of silk. It was paraffin ceresin.

Mr. Jaeger—We used the silk serecin which we collected.

Mr. Harkins—How did you obtain it? We weren't able to locate it.

Mr. Jaeger—We got this over in Paterson at one of the large piece dyeworks.

Mr. Harkins—You precipitated it on the fabric?

Mr. Jaeger—No, we dissolved it in tetrachloride, and let the fabric take up as much of it as it would.

Mr. Harkins—In our scouring determinations we used the textile Launder-Ometer adopted by the Association, running our tests over a period of half an hour, I think it was (half an hour or three-quarters of an hour), in some cases using distilled water, using ½ per cent soap concentration, 98 per cent anhydrous soap, and we were never able, on woolen flannel, to remove more than 9 to 10 per cent of soil.

Mr. Jaeger—How fast was your machine running?

Mr. Harkins—At about 35 or 40 r.p.m; don't know offhand what it was.

Mr. Jaeger—Have you any idea of the ratio of fabric to liquor that you were using?

Mr. Harkins—One to 50.

Mr. Jaeger—That is about what we used. At what temperature were you operating?

Mr. Harkins—At 120 deg. Fahr.

Mr. Jaeger—We operated at 55 deg. C. That is about the same, a little lower.

Mr. Harkins—On the other hand, in using bleached material, cotton cloth, where you eliminate such factors as Felting, moisture, and such possibilities as would have a tendency to throw off your calculations, so far as your weightings on increased and decreased soil material go, the decrease or regain in moisture is less. If you use cotton the figures are a whole lot more consistent, being within a half to three-quarters of a per cent, on the average.

Mr. Low—May I say that the point Mr. Harkins is trying to bring out is that we can take cotton cloth and soil it with any of a whole lot of different things, different combinations of things, and consistently show our results there, using different soaps and additions of different solvents, and we can repeatedly check that by taking the same percentage off, by adding the same percentage of pine oil, tetralin, or anything else. From that, we felt it was fair to assume that much the same action must be taking place on wool because, as I say, we were never able to get a consistent result on the wool, and we always felt that it was due to our inability to distinguish between some water present and the soil remaining.

Mr. Jaeger—We considered working with distilled water and then we eliminated that, giving the solvents the benefit of any hardness, of which I believe lake waters

show 7 at their best, and up to 9 or even 10 grains per gallon. The solvents have, supposedly, a softening quality, or at least the calcium and magnesium salts are not as easily precipitated, if I may put it that way, in the presence of solvents as they are in baths without these solvents. I think if you will work with the straight water which an industry gets, rather than with distilled water, your findings may be a little different, too.

Mr. Low—Of course, the findings would be different all around with different water, so we felt that any basis we would have for concluding to what extent the addition of a solvent would be a virtue, would have to be made with distilled water and then a separate series of tests for its effect in Chicago water, or in Massachusetts water, and so forth.

Mr. Jaeger—I quite agree with you—

Mr. Low—But you couldn't combine the two tests.

Mr. Jaeger—We did all our work with straight tap-water.

Mr. Harkins—Chicago tap-water?

Mr. Jaeger—Yes.

Mr. Harkins—You have to expect, in water containing anywhere from 9 to 10 degrees hardness or grains per gallon of water, a decrease in the efficiency of any soap or solvent.

Mr. Jeager—I would expect that, knowing what the water is.

Mr Harkins—In view of that fact, don't you think it would be more logical to apply distilled water scouring tests, to eliminate such factors as you may encounter?

Mr. Jaeger—I think that might be more optimistic, at least.

Mr. Harkins—What I am trying to bring out, Mr. Jaeger, is that I can't see how it is possible for you to remove so much soil in five minutes' time in a hard water, because with flannel, in our determinations, we were unable to get, at the most, 20 per cent of the soil removed.

Mr. Jaeger—Do you know what the titer of your mixture was, or the nature of lanolin?

Mr Harkins—No. We used commercial wool grease in our determinations.

Mr. Jaeger—At 55 degrees, how much soil did you have on there?

Mr. Harkins—We had on the average—

Mr. Jaeger—We had an average of 30 per cent soil on these little pieces of flannel which we used.

Mr. Harkins—My figures were in between 25 and 30 per cent.

Of course, with regard to the ceresin we used, we didn't think of using silk serecin, because the question in that case would be more or less one relative to silk only. It has possibilities of being saponified, and that is the only means of removing it, in silk scouring, as you know, so when you are applying it to wool, you are applying something that is insoluble. It is a thing which is not soluble in any solvent. If it is, I should like to know which!

Mr. Jaeger—So would I like to know that.

One other difference is that our machine is probably traveling faster than yours. Ours was going at 225 r.p.m.

Mr. Harkins—Then you will admit that that is mechanical action.

Mr. Jaeger—Yes, I will grant that.

Mr. Harkins—Were the figures in variation from a mean on the determination you were making?

Mr. Jaeger—With pure silk we were able to remove 61 per cent, down to the worst with 15 per cent of solvent, from which we were able to remove about 35 per cent.

Mr. Harkins—Is that 61 per cent a figure that you got on one determination or on a number of determinations?

Mr. Jaeger—On three.

Mr. Harkins—And you obtained in every case 61 per cent?

Mr. Jaeger—I would say that there was probably a deviation of 2½ to 3 per cent one way or the other.

Mr. Harkins—We were not able to obtain that in a laundry machine, using wool flannel, but we were when we used bleached soisette. But in making tests on wool, we applied a different method of determining or evaluating the actual solvent action of these hydrogenated solvents in the scouring bath. We took finished pieces of cloth from the loom. When I say "a finished piece of cloth," I mean a cloth containing more or less natural soils such as spinning oils, fats, waxes, sizes etc

M. L. Griffin—I have listened to this discussion, without much profit. I see no reason why experimenters should take academic dirty cloth for a test. Let me make a suggestion for those who are experimenting in this way: take common newspaper and use that as your dirty sample to work with, and then you can easily measure it to begin with and measure it when you are through, and you will have something that you can work on just as well. (Laughter.)

Mr. Low—That is a very good suggestion, but we have confined our tests more to things that are not artificially soiled but that are soiled in the process of manufacture. That is, our wool tests have been for the most part with wool fresh from looms, which contains its natural grease and its greases incidental to spinning and weaving, and we have checked our tests on that in the action of solvents with extractions with petroleum ether, which we think is a whole lot more accurate than trying to weigh the cloth before and after treating. We get consistent and accurate results. I was interested in Mr. Jaeger's results because we had always found that a solvent for

those natural greases did take them out no matter whether it was soap or grease alone; it took out just so much for each per cent that was used that is up to its optimum point, after which we didn't get any better result. We have always felt that the natural soil was the thing to work with, rather than artificial soil, because we can never trust our artificial soil to be as representative of what is more important, as intimately mixed with the fiber as real soil is.

Chairman Williams—Is there any further discussion?

R. M. Fuoss—I should like to ask Mr. Jaeger whether the percentage of carbon in his removed soil was the same as that in the original soil applied to the cloth.

Mr. Jaeger—That is rather a hard thing to say, because we rejected 50 grams of roofing tar which contained the only carbon which we used in the mixture.

Mr. Fuoss—That is, your soil on the cloth had a comparatively small amount of colloidal stain?

Mr. Jaeger—Yes.

Mr. Fuoss—Then your method of following your detergency, that is, per cent loss of weight on washing would not give a direct measure of the efficiency of the soap plus solvent, say, in a laundry?

Mr. Jaeger—No, it was an extraction of fats, more than an actual detergent extraction, that we were after.

Mr. Fuoss—Do you have anything to show the value of the use of solvents plus soap in the removal of colloidal stains?

Mr. Jaeger—I have not.

Chairman Williams—Is there anything further on this paper?

I will now turn the meeting over to Mr. Culver, who is in charge of the entertainment.

* * *

Chairman Williams—The next paper to be presented is entitled, "Cellulose and Its Importance to Textile Industry," by Dr. John E. Jackson.

. . . Dr. Jackson presented his paper:

Cellulose and Its Importance to the Textile Industry

By Dr. John E. Jackson
Research Chemist

THE word *cellulose* comes to our notice often and under many diversified headings these days. You can hardly pick up a magazine or a paper without seeing its mention in one form or another and still its real meaning often escapes us. Cellulose comes in many modified forms, and new uses for some of its products and by-products are being discovered daily, to say nothing of the new raw materials.

All industries are more or less dependent on some form or other of cellulose and I will endeavor to show briefly how much the textile industry is thus dependent and also what recent research with raw materials is doing towards newer developments.

Probably the best known form in which it appears is cotton; but the long fibered cotton as it comes to the mills in the bale is by no means the only way in which cotton cellulose reaches the textile industry. Every textile man is more or less familiar with the varieties of cotton, especially under the broad classification of American, Sea Island, Egyptian, Brazilian, Peruvian, Algerian, West Indian, African, Indian, Chinese and its sub-divisions as American Orleans or American Upland, etc.

The cotton, after passing through the gin, leaves the seed, which is mainly used for its oil and which still has a coating of the short seed hair. The seed hair that is left on the seed is re-cut and the fibre is known as the linter, some of the uses of which I will mention later. The hull that is left after the oil-bearing kernel has been removed was formerly a waste, or at best of very questionable value, but lately some enterprising companies are working this material and get from it a very uniform cellulose in two forms; one is in the form of hull fibre which has very similar uses to cotton linters but has a more uniform chemical content, and the other is in a powder form known as cellulose powder, which although a very recent development offers many uses of great value in many industries, including the textile industry.

It is quite unnecessary to say much about the various uses for the long staple cotton fibre itself, because its use in the textile industry and the various kinds of fabrics made of cotton are already well known to everybody. But we seldom think of cellulose when we talk about a piece of cotton cloth, or sewing thread, or knitted cotton socks, or mercerized cotton braid, or hydrolized buchram for lapel stiffening, or the string we use to tie the finished piece of cellulose cloth, which consists, for instance, of a cotton cellulose dress fabric with a stripe of cellulose rayon, which has cute little dots of cellulose acetate; it was dyed in a wood cellulose tub with a dye made from the cellulose by-products of corn stalk and sized and finished with a cellulose compound; enclosed in a cellulose cellophane tissue and then a pulp cellulose sheet of paper wrapped around it and a cellulose paper label, printed with an ink from cellulose by-product of straw, is pasted on with a cellulose by-product paste made from corn cobs. It has been inspected by the girl with the cellulose rimmed glasses who OK'd it with her cellulose handled pen of celluloid—or was it cellulose bakelite? However, it was recorded in the little black book with the cellulose leather cover.

Well as I started to say, the uses of cotton cellulose in the textile industry are too well known to say much about it, but the cotton linter and hull fiber in their many modifications are finding more and more uses daily. One of the oldest uses is in the nitrated form or nitro-cellulose in its various degrees of nitration, which can be used all the way from an explosive to mine the coal to generate our steam or the shell used to kill the fox which we use to trim our lady's opera coat, to our fine nitro-silk or Tubize, which is now made commercially of a fineness as low as 35 denier. It is used also as the base for celluloid, which finds many uses in the textile industry and in our everyday life—all the way from our advertising matter to the very buttons that hold our clothes together. Again, the nitro-cellulose finds its use in the lacquers that are of immense value in nearly all industries. It is used as an insulation material and even to dress our wounds in the form of collodion or in the film on which we photograph our factory for our advertising campaign.

Rayons and Plastics

One of the next uses of linters, or hull fiber is for making the acetate rayon or Celanese. Incidentally the cellulose acetate is the base of our non-inflammable film and also the glass substitute which lets in the ultra-violet light so much needed for our good health. Many minor new uses for the cellulose acetate are also appearing continually.

Linters are also used either alone or with wood cellulose to make viscose rayon and Cellophane.

All the above products of cotton linters, either in their pure form or in some modification, are of great importance in many industries which either directly or indirectly are related to the textile industry; plastics in their various forms being probably the most important products. Linters are also the base for the cuprammonium rayon better known to us as Bemberg rayon.

Cellulose flour has found many uses; in fact, it can be used in most instances where a high grade wood flour is used as a filter as for bakelite, wood filler in general, for plastic wood, special putties, doll heads, toys, etc. In textiles it has been used in conjunction with sizings, in printing as a mixture in the resist or discharge paste, also mixed with some of the cellulose esters, especially the acetate, as an applique raised design or beads on textiles and in linoleum, etc.

In addition to the above uses, much of the hull fibre as well as linters are used in special papers with various pulp mixtures.

There are at present only a few cellulose-bearing plants from which we derive our cellulose for the textile industry, but new discoveries that have been the result of concentrated research efforts in all industrial lines have made it possible to utilize cellulose-bearing plants for textile purposes which would have been absolutely useless a few years ago.

The most important cellulose bearing fibres used for the textile industry are probably cotton, flax, hemp, istle, jute, kopac, manila or colorado hemp, New Zealand flax, sisal grass, ramie, pita.

The minor seed hairs are bombax cotton or vegetable down, bombax pentandrum or kopak, *Cibotium glaucum* or pulu fiber of Hawaii, *Asclepias* or vegetable silk or milkweed, vegetable wool from pine cones; all have special uses, usually as mixtures with other fibers.

Of the usual fibers flax from its various sources is also very well known. Even more than cotton the quality of its cellulose content is influenced by locality and climatic condition as, for instance, the flax from Egypt or India which is usually considered poor, that from Russia as medium, that from Ireland, Portugal, France, Belgium, Holland, Denmark as best.

The same is true of hemp, and in both cases as well as in the case of many other groups or families, the selection from a number of varieties is even more important as, for instance, the ordinary hemp or *cannabis Indica* is nearly as good a fiber as flax, and so all the way down through some thirty-six varieties to the *Hibiscus plastris*, which is practically worthless as a textile fiber.

Jute also has the same variation, although its use as a textile fiber is very much more restricted. Ramie or China grass are worthy of a more lengthy explanation mostly owing to the fact that so much recent development has brought them to the front and they are less known than the aforementioned fibers.

Ramie

Ramie consists of the fibrous portion of a grass or shrub known from time immemorial by that name. The linen of biblical reference, used by the Egyptians in their mummy wrappings, in some instances referred to as "vegetable silk," "China grans" or "Ramie hemp," has been used in the Orient always as a source for textile uses, where it was prepared by retting and hand scrubbing.

Ramie matures in from thirty-five to forty days, attaining a height of 10 feet with widths of the blade as great as three inches, depending on the fertility of the soil and moisture of the seasons, which means that at least three cuttings will be harvested each year, and will grow in any climate of temperature and moisture permitting the warmth of soil necessary to germination.

Advantages for textile fabrication, making ramie

so desirable, are the comparatively long fiber, tensile strength and toughness, glossy appearance of each finished thread, affinity for dyes, resistance to alkalis and acids in preparation and capacity to remain in storage for long periods of time when properly cured, the low initial costs of degumming, and by-products having marketable demand.

Ramie is in use wherever a quality of fineness equal to the best grades of linen is demanded by service; is an economic textile in the fabrication of laces, velvets, plush, velours, muslin, shirtings, table linen, sewing and crochet thread, hosiery, underwear, canvas, awnings, tents, belting, high pressure steam packing, fire hose, twine, rope, fishing nets, airplane cloth, cordage for use in automobile tires, base for weather-proof clothing, as water will not rot the fiber; will resist washing and wear to a greater extent than the best grade of linen used for clothing purposes.

The principal hotels in France are using ramie exclusively in the place of linen or cotton fabrics; the city of Paris has adopted ramie in the service equipment of its twenty public hospitals. Ramie lint and bandages are being used and highly recommended by army and navy hospitals—adopted by ministers of war as ballon and parachute cordage, powder sacks, etc. Ramie is used by the Bank of France in the manufacture of bank notes exclusively.

There are a great many uses for this age-old fiber that are not mentioned here. In the Orient, where the original hand methods of scrubbing the fiber are in use to-day, the process is slow and not economical, one man producing about three pounds in eighteen hours—the process intending, of course, to separate the fiber from the stalk and adhering gum, which constitutes twenty per cent of the weight of the plant.

There are in operation in Europe and the Orient established factories which produce ramie fiber yarn for the various looms that make it into finised goods. Owing to losses, or costs of de-gumming and bleaching at these plants, the several processes in use are subject to a wide margin of improvement and economy—in some instances the waste amounting to fifty per cent of the weight of material, leaving about thirty per cent of the fiber suitable for use in the best quality of cloth, and while a very distinctive dress fabric is obtained it does not compare with silk.

With improved methods, however, fabrication costs are the same with ramie as prevail in any other like fiber with the advantage in favor of the exceptionally continuous lengths and strength of ramie fiber.

Pita, or *Bromelia Magdalenae*, also offers a fiber of great interest, mostly on account of the new mechanical developments for its treatment, lack of which has been its chief drawback for many years.

The pita plant is found mostly in different parts of Colombia, from practically sea level to about 3,000 ft. above. It is, however, more usually found in patches, and not generally covering large areas except in a few localities, such as in the Carare and the Atrato. From the manner in which one finds the plant growing in the interior of Colombia, in clumps or patches, it is not improbable that at one time it was cultivated or conserved by the indigenous Indians, who, from time immemorial have prized its fiber for its great strength and durability.

The Durable Pita Fiber

The pita fiber is valued by the Colombians as being the strongest and most durable of its class, and is employed by them for many purposes. Large quantities of pita fiber are employed in the manufacture of fishing nets. It is also used, waxed, by local shoe makers instead of thread for sewing boots, etc. In Mexico the fiber was formerly used for strings of musical instruments, for fancy needlework and, waxed, for saddlery and leather work.

Commercially it would be classed as a hard fiber and would enter into competition chiefly with henequen or sisal hemp, for ropes and for use as binder twine in harvesting, though it is finer, stronger and far superior to the fibers mentioned, and really too good to employ as binder twine. There are now some local manufacturers in Colombia who employ this fiber for the manufacture of coffee bags, which have a large market in Colombia.

Experiments have been made with the view to its use as a substitute for silk in fancy cloth mixtures and for the manufacture of cloth, with promising results. For such applications it would, of course, realize much higher prices than if used in competition with sisal.

There are many other fibers worthy of attention such as hops which belong to the same family as hemp and has a similar fiber but requires a different treatment; although not important in this country it has received some interesting research recently. I am familiar with an instance where its fiber mixed with mulberry (*Broussonetia Papyrifera*) has been used to make a special paper so strong, and yet so supple as to be used for draperies or even dress.

Mulberry makes a very beautiful mixture with other textile fibers and should be subjected to more research to obtain similar tissues as some of the old Japanese or South Sea island cloth. Some successful experiments have already been conducted and offer a

very interesting development for both the textile and paper industries.

Spanish grass, esparto and many of the various grasses, offers a practically virgin field of research which is sure to be remunerative.

Chairman Williams—As we are somewhat behind in our program, we are going to postpone the discussion of this paper until after we have had the next paper, but we are going to have a little entertainment in between.

* * *

Chairman Williams—We will now have a paper by Mr. G. L. Armour, on "Treatment of Wool with Active Chlorine in an Organic Carrier":

Treatment of Wool with Active Chlorine in an Organic Carrier

By G. L. Armour

American Aniline Products, Inc.

AKTIVIN, which is the topic of my essay, is the sodium salt of para-toluenesulfonchloramide. It is a white or slightly yellowish powder, with a neutral reaction to phenolphtalein, and faintly alkaline to litmus. It is non-poisonous and soluble in water.

Unlike the inorganic preparations with available chlorine now on the market, Aktivin in its powdered form as well as solutions of water or alkaline media, is very stable and can be boiled for hours in the absence of oxidizable substances, without losing appreciable amounts of chlorine.

The chlorine content of Aktivin is 20 per cent, which renders the preparation useful as a desizing agent for various textiles, as a solubilizer of starch in the preparation of sizes or finishes, and as a valuable addition in kier boiling, saving 14 to 16 hours in boiling, and achieving a better white without detriment to the tensile strength of the goods. It is used also to oxidize vat-dyed textiles, whereby the colors are rendered more vivid, while the white ground of printed goods is simultaneously intensified by treatment with Aktivin. Its especial use in the chlorination of wool, is, however, the subject of my address, and I shall, therefore, explain its adaptibility to this field.

All of you are fully aware of the necessity of treating wool with some chlorine compound before printing, and as the time alloted me is limited, I shall refrain from going into the scientific details of this process. Chlorination results in more lustrous fabric, and the fibre gains thereby a greater affinity to dyestuffs, which renders the colors more brilliant and uniform. Wool so treated does not felt or shrink later on.

The treatment with Aktivin is as follows: After wetting out, the goods are squeezed, the full width run through a cold acid solution and entered directly into a cold Aktivin solution. This procedure is recommended for a continuous machine, the speed of which, for best results, should not be higher than one yard per minute. The so-impregnated cloth should be left for ten minutes, and then washed until the cloth is free of acid. An antichlor treatment with H-202 (hydrogen peroxide) is recommended. In dyehouses where no continuous machine is available a dyebeck will do as well, and one proceeds in this manner: The dyebeck is filled with cold water, to which the necessary Aktivin dissolved in hot water, is added. The solution is then acidulated, and the wool cloth is run through the process for 15 to 20 minutes, washed and after-treated with antichlor. The quantities of Aktivin, as well as the kind of acid to be used, depend entirely upon the weight of the goods, and the desired effect. One per cent by volume is sufficient for average use; if very deep hues are wanted, stronger solutions will be necessary, while for light, brilliant shades a 0.2 per cent solution suffices.

When one remembers that sulphuric acid, though the cheapest in price, is very difficult to remove, hyrochloric acid is chosen as next best. Although formic acid imparts a much softer feel to wool than either of these two, its higher cost prohibits its use for general purposes. Acetic acid has a much milder effect, and its use is recommended when treating woolen articles with Aktivin to prevent shrinkage, a process which is applied to jerseys and other knit goods.

A word might be said of the chemical process of Aktivin in the chlorination of wool. In the presence of acids, Aktivin forms the organic compound $CH_3C_6H_4SO_2NCl_2$, or toluenesulfondichloramide, which forms white needles in the solution at room temperature, and is the cause of the cloudiness or turbidity when Aktivin solutions are acidulated. This bichloramide has good affinity to wool, by which it is readily and evenly absorbed, and imparts to the cloth the aforementioned desirable properties.

The advantages gained more than balance the higher price of Aktivin, in the elimination of objectionable chlorine fumes, and the constant chemical control which is rendered possible by its use. There is no deterioration of the apparatus, beyond ordinary wear, and when the correct formula for the particular effect desired is once established, uniform results are assured due to the stability of Aktivin and its simple application.

Chairman Williams—Is there any discussion on either of these papers?

Walter Durfee—I should like to ask Mr. Armour if there is a shade card on this subject.

Mr. Armour—We have a few booklets here, by the Aktivin Corporation, and if there are any gentlemen here who would like to have a copy, we have a limited supply and you are very welcome to them.

Chairman Williams—Are there any other questions? If not, we will proceed with the entertainment.

SATURDAY MORNING SESSION

December 8, 1928

Business Meeting

President Killheffer—Gentlemen, if you will be settled we will proceed with the business meeting of the Association.

We will have the report of the tellers. Is Mr. Durfee about?

Secretary Hadley—I don't believe the tellers are ready yet.

President Killheffer—We will then proceed to action on the proposed amendment to the Constitution, which all of you who are interested have found on the back of the program for this meeting.

PROPOSED AMENDMENT FOR ART. XV

Par. 2. Change "President" to "Chairman."

Par. 4. Change to read as follows: "A Sectional Committee shall not be entitled to draw from the Association Treasury in any one year more than a sum represented by $1.00 per member affiliated with the Section for the year in question. All expenses of the Section shall be paid by the Treasurer of the Section from the Local Treasury. Funds for the payment of such expenses shall be furnished when required up to the amount of $1.00 per member in good standing affiliated with the Section, by the Treasurer of the Association on receipt of a request from the Local Treasurer endorsed by the Local Chairman. The Local Treasurer shall keep full accounts of all receipts and expenditures and shall furnish the Treasurer of the Association with an annual account of expenses each year before December 1st. (of the succeeding year).

The proposal was signed by the required number of members as follows: D. P. Knowland, Wm. H. Cady, William D Appel, William R. Moorhouse, Joseph F. X. Harold, W. M. Scott, P. J. Wood, H. D. Clayton, H. Christison, L. A. Olney and E. H. Killheffer.

The main purpose to be accomplished is, really, a clarification of our present provisions in regard to the matter of expenditures by local sections.

If it is agreeable to the members, we will, without further ceremony, proceed to vote on whether or not this meeting wishes to pass these amendments which must be done by a two-thirds vote of those present, and if they are so passed, they will then be subject to a letter ballot of the entire Association. Are you ready for such a vote? I would ask that all the members here who are in favor of the passage of these amendments to a letter ballot of the Association signify by rising; those opposed please rise.

I declare these two changes passed for submission to a letter ballot of the Association for final adoption.

Is the Secretary ready to make his report?

. . . Secretary Hadley presented his written report.

Secretary's Report for Year 1928

THE Council of the Association has held six meetings, three in New York City, and three in Boston, Mass, since the Annual Meeting held in New York City in 1927.

The Research Committee has held eight meetings, three in New York City, and five in Boston, Mass., during the same period.

The Corporate Memberships show a steady increase.

The Associate Membership, started during the past year shows a healthy condition, and indications are that this type of membership will serve a very useful purpose.

During the past year we have added to the membership 97 Active, 28 Junior, 12 Associate and 17 Corporate.

Ten Junior members have been transferred to the Active list.

Four members have died, and four members have resigned during the past year.

Sixty-six members have been dropped for non-payment of dues.

The total membership at the present time is as follows: 823 Active, 148 Junior, 12 Associate, 31 Corporate. Total 1,014.

WALTER E. HADLEY, *Secretary.*

President Killheffer—Gentlemen, you have heard the Secretary's report. What is your pleasure?

. . . It was voted, upon motion regularly made and seconded, that the Secretary's report be accepted and placed on file.

President Killheffer—The Treasurer's report—will you please read it, Mr. Secretary?

Secretary Hadley—Mr. Durfee is busy counting ballots and so he has asked me to read his report.

Treasurer's Report

GENERAL FUND

Cash on hand November 3, 1927	$3,532.16
Receipts	
Cash on hand November 3, 1927	$3,532.16
Dues	4,887.50
Contribution—General Fund	55.00
Year Book	15.01
Howes Publishing Company (refund)	310.42
Journals	27.50
Emblems	15.00
Interest (American Trust Company, Boston)	144.62
	$8,987.21
Expenses	
Administration	$1,741.37
Journals	2,746.51
Sections	609.48
	$5,097.36
Total Receipts—General Fund	$8,987.21
Total Expenses—General Fund	5,097.36
Balance, General Fund—November 9, 1928	$3,889.85

RESEARCH FUND

Cash on hand November 3, 1927	$2,809.55
Receipts	
Cash on hand November 3, 1927	$2,809.55
Contributions and Corporate Memberships	2,890.00
	$5,699.55
Expenses	
Expenses for 1928 (including salary to Research Associate, $225; prizes, etc.,	$2,461.16
Total Receipts—Research Fund	$5,699.55
Total Expenses—Research Fund	2,461.16
Balance Research Fund—November 9, 1928	$3,238.39

WINTHROP C. DURFEE, *Treasurer.*

President Killheffer—A motion is in order to accept this and place it on file.

. . . It was voted, upon motion regularly made and seconded, that the Treasurer's report be received and placed on file.

President Killheffer—We will now have the report of the Committee on Prize Awards. As you know, the Association each year awards four prizes for the most meritorious papers submitted during the year. May we hear from that Committee now, Mr. Cady?

Report on Prize Awards

Submitted by WM. H. CADY

Mr. Cady—Mr. Chairman and Gentlemen: You probably know that four prizes are awarded annually, one of $100, one of $75, one of $50, and one of $25. We have awarded these prizes as follows:

The first prize to Mr. Carl Z. Draves, for his paper, "The Use of the Spectrophotometer in the Dyestuff Industry," published in the AMERICAN DYESTUFF REPORTER, January 23, 1928.

Second prize—Prof. Albert H. Grimshaw, for his paper, "Methods of Testing Sulphonated Castor Oils for the Determination of their Fatty Content," published in the proceedings in the REPORTER, March 5, 1928.

Third prize—Mr. John F. Warner, for his paper, "Some Methods of Handling Cotton and Rayon Piece Goods," published in the Proceedings in the REPORTER, December 26, 1927.

Fourth prize—Prof. Edward R. Schwarz, for his paper, "Practical Textile Microscopy," published in the REPORTER, April 16, 1928. (Applause.)

President Killheffer—Now we will have the report of the working committee of the Association, the Research Committee, of which Dr. Olney is the Chairman. (Applause.)

Report of the Research Committee

Submitted by DR. L. A. OLNEY, *Chairman*

MR. PRESIDENT, I will say at the outset that there are two things I am not going to do: one is to read the report of the Research Committee, which will be published in the Year Book, and which we believe every member will have within two weeks; and the second thing I am not going to do is to anticipate the reports of some of our sub-committees; they will present their own reports.

There are several things, however, which I should like to bring to your attention.

Since the last annual meeting the following additional standard tests have been added to those already recommended or adopted by the Association:

Fastness to crocking;

Fastness to stoving;

Fastness to de-gumming of dyed silk.

And the Sub-Committee on Fastness Tests for Dyed Wool is at the present time formulating methods for determining fastness to crabbing, steaming and decotizing.

THE LAUNDER-OMETER

The most important thing, perhaps, which the Research Committee has accomplished during the year, or at least

one of the most important things, has been the introduction of the Launder-Ometer. The adoption of standard methods of testing the fastness of dyed textile materials to washing, laundering, and so forth, naturally, led to a study of the proper type of apparatus to be used in carrying out such tests. The Committee found that variations in the results obtained by different workers were due to lack of uniformity in the apparatus used and in the manner of carrying out these tests, rather than to fundamental faults with the specifications of the washing methods. With that in mind, several members of the Research Committee—Mr. Appel, of the Bureau of Standards; Mr. Christison, of the Arlington Mills; and also Mr. Smith, our Research Associate—were instrumental in developing the machine which we have called the Launder-Ometer.

We have one of the pieces of apparatus on exhibition here this morning and I am going to leave it to Mr. Appel to explain it more fully, and if it can be arranged, we will run a demonstration of this machine some time during the noon hour, or the early afternoon.

I might say, in this connection, that this particular machine is a new one which has been sent here through the courtesy of the Atlas Electric Devices Company, who are the authorized manufacturers of the Launder-Ometer, and this particular machine will be delivered to any member of the Association who wishes to order one at this time.

The regular price of the Launder-Ometer is $220 but the members of the Association should know that there is a discount for members, so that that amount is reduced to $187. That includes the Launder-Ometer with the complete motor and the auxiliaries which go with it. That will all be explained a little later.

I might say, in addition, that this same apparatus may be used for many other purposes. The Research Committee believes that the testing of sulphur dyes, and the testing of vat dyes in a comparative way, could be conducted very nicely in this apparatus.

Future Plans

Just a few words in regard to future plans of the Research Committee.

The Research Committee still has in contemplation the preparation of standard dye samples representative of the Association's standard classification on materials of all fibers, with respect to both light and washing. The Association also purposes to undertake when funds are available the classification of the most important dyestuffs in accordance with the Association's standards for fastness to *all* color-destroying agencies. This work will, of course, begin with the more important dyestuffs and continue as funds are available until the entire list shall have been classified. When this work is complete it will be possible to designate any known dyestuff by reference to a printed list as Fastness 1, 2, 3, and so forth, when applied to any particular fiber, as to light, and other color-destroying agencies. It is particularly desirable in connection with this work that an international agreement be formulated, if possible.

At the present time, plans are being considered for the establishment of a central research and testing laboratory. That is something which our President has very close to his heart and I am going to leave any remarks on that entirely to him.

It is hoped that before another year passes sufficient funds may become available through the increase of corporation membership to greatly enlarge the work of the Research Committee.

Other things which we have in mind are to take a survey during the early months of next year of possible ways for the advancement of the work of the Research Committee. In other words, we wish to find out by a systematic survey of the whole field just what the Research Committee can do that will be of greatest advantage to the Association. In this connection, at a meeting of the New York Section within the last two months, I brought out the point that when we have sent out questionnaires asking for definite recommendations for the Research Committee we have received a very meagre response. That may be due to the fact that the questionnaire has so many other things upon it that that particular question is in the background. So in the near future we shall send out a questionnaire which has absolutely nothing upon it except that one question: What will be your recommendations for future plans and work of the Research Committee?

Another thing which the Research Committee is to undertake in the near future is a study of the literature pertaining to textile chemistry and dyeing, and we hope that in the Year Book a year from now we can make sufficient progress to publish quite a report.

The paper which was presented in regard to the question of rubberized fabrics and the vulcanization of them and the presence of metals also leads to a very important subject, and one which might well be considered by the Research Committee. That subject will be given full consideration at our next meeting.

As to the sub-committees, the first committee that I shall ask to report is the Sub-Committee on Cotton Fastness to Washing and Laundering and Mr. Moran is Chairman of that committee.

(*Continued on page* 831)

Report of Sub-Committee on Fastness of Dyed or Printed Cotton to Domestic Washing, Laundering and Soaping

Submitted by SUB-COMMITTEE CHAIRMAN G. A. MORAN

DURING the past year the attention of your Fastness to Washing Committee has been directed to the development of mechanical means of applying the washing tests. Heretofore, the tests have been carried out by ordinary laboratory methods in beakers; these were slow and much time was consumed if many samples were to be tested. It was also difficult to produce the same effects that result when fabrics are subjected to repeated laundry treatments. Originally, the tests were drawn up to classify the fastness of dyestuffs for the information of the chemists and dyers using the dyestuffs. But, this object has changed to the more practical one of establishing and guaranteeing standards of fastness of dyed fabrics for the information of the consuming public, who are primarily interested in the effects either of domestic or commercial laundry treatment.

Domestic laundering is a very uncertain treatment. It may be only a moderate sousing of the goods in a neutral soap solution at low temperature or it may be an extreme treatment as regards chemicals, temperature and handling. Public laundering is also variable, but there are standard methods recommended by the Laundryowners National Association which may be taken as a guide and assumed as a standard washing procedure to which dyed or printed fabrics are likely to be repeatedly treated, and which they must stand reasonably well if they are to be satisfactory to the purchaser.

Your committee has, accordingly, undertaken to study the results of public laundering, as carried out in reliable launderies on a wide range of dyed and printed fabrics. All the commonly used types of dyestuffs, both fast and fugitive, have been included. These were subjected to repeated launderings—one, two, five, ten, twenty and thirty, and results noted.

ADJUSTMENT OF WASHING METHODS

The standard washing methods are now being adjusted so that when applied by the mechanical washing machine now being commercially manufactured and marketed by the Atlas Electric Devices Company under the name of the Launder-Ometer, the results obtained will indicate how much a color will suffer by repeated trips to a public laundry, say ten launderings, and will be an accurate guide to the purchaser as to what may be expected in the way of fastness to washing, providing standard laundry procedure is followed.

Experience shows that but limited classification is possible when dealing with the public; goods are either fast or not fast. Colorings that pass our standard wash test can be designated as fast, as we know they will stand laundry treatment which has been definitely and officially standardized; those that fail to pass the test must be designated as not fast or commercial. Under the *Fast* classification, there is a B division which includes colorings that are affected by chlorine but are otherwise fast. Under the commercial classification, there is a B division that includes colorings that possess no fastness to washing whatever, but that find use where the fabric is not expected ever to meet with washing treatment.

The work of correlating the standard washing methods with the results of repeated commercial launderings is not entirely completed. Tentative methods have been adopted but these may require some modifications, as more extensive experience with the washing machine may indicate is necessary.

Mr. Moran—The methods as revised to adapt them to the Launder-Ometer have been adopted tentatively and are to be sent out by the manufacturer of the machine, along with the machines, as they are distributed, so that those can be followed and if later experience shows that any changes or modifications are necessary, those will be communicated at a later period.

Dr. Olney—The next sub-committee that I shall call on is that on Fastness Tests for Dyed Silk. Dr. Scott is the Chairman of that committee.

Report of Committee on Fastness of Dyed Silk

Submitted by DR. WALTER M. SCOTT

At the present time the Fastness Committee on Silk is engaged in the work of correlating the standard fastness tests which have been devised for laboratory testing of the fastness of silk to washing, with proposed tests to be made in the Launder-Ometer, the new washing machine which has been mentioned here. These tests are in the process of being made and the Silk Committee hopes to be able to publish a report in the very near future. We feel that the general definition of the fastness classes, or the classes of fastness of silk, with respect to washing have been pretty clearly established and the work which remains to be done is to link up the actual procedure in the Launder-Ometer and to determine upon dyed silks which can be used as standards for fastness to washing. This work, as I say, is being carried on and we hope to render a definite report on the same in the early part of next year.

Thank you. (Applause.)

Dr. Olney—Mr. Cady, Chairman of the Light Fastness Committee, will report for that Committee.

Report of the Sub-Committee on Fastness to Light

Submitted by Sub-Committee Chairman Wm. H. Cady

Light Exposures, Series V.—We refer you to our report published in the American Dyestuff Reporter June 25, 1928, entitled, "The Fading of Dyed Textiles in the Light Transmitted by Various Glasses," in which there is an account of the exposure of twenty dyeings to sunlight without a glass cover and also under window glass, Corex, Vita, and six other special glasses of known transmission. The fading was recorded in the form of quantitative reflection measurements. The spectral distribution of the light passing through these various glasses and the extent to which the fading of the dyeings is affected by them, are reported.

Light Exposures, Series IV. This series, you will recall, consists of some 1,300 dyed samples, exposed to the sun in a variety of ways and also to the violet carbon arc, in order to determine: 1, the best sort of a sun test for standardization purposes; 2, the relative fastness to sunlight of all of the best known dyes; 3, the effect on this relative fastness of variations in the conditions of the sun test; 4, the effect on this relative fastness when the violet carbon arc is substituted for the sun; 5, what dyes are the most suitable for use as standards of light fastness.

The exposures which have been in progress for the last two and one-half years are now practically completed and the vast mass of data obtained from them is now being tabulated. It is hoped that the first section of our report will be published within the next six weeks. This will describe the mechanical details of all the exposures and will show graphically how the relative fastness of the dyes is altered by variations in the conditions of the exposure; but any attempt to tabulate the precise fastness of all the dyes, or to prescribe definite standards of fastness, must be postponed until a later period. In the meantime we have started the fading of a new set of twenty dyeings which have been specially prepared for use as possible standards of light fastness based on the experience of the previous trials. These new dyeings will probably require a year of exposure to sun before anything definite can be decided, but as a preliminary operation we have exposed them to the violet carbon arc (Fade-ometer) for a total of 597 hours, and those who are interested may examine the results in the rear of this room after the meeting.

The selection of proper standards is a matter requiring extreme care and much experimentation. A standard to be generally acceptable, must have the following qualities: 1, it must not be appreciably affected in its fading by variations in the condition of the sun test (for example, it should fade approximately the same with or without glass, and either exposed continuously or only when the sun is shining); 2, it must fade about the same in the violet carbon arc as in the sun; 3, it must fade continuously, showing clean-cut differences in intensity of color for the different periods of exposure, and without too much change in shade; 4, it should preferably be a dye of well-known composition, well standardized, and easy to apply to the fiber. All of these requirements are being considered by the Committee in selecting its standards, and while progress may seem a bit slow, we feel that the final result will justify all this extra time and effort.

Through the co-operation of the British Research Association for the Woollen and Worsted Industries two sets of our Series No. 3 dyeings have been exposed in the Fugitometer, a carbon arc lamp similar to the Fade-Ometer, but having controlled temperature and humidity, which has been developed by the British Association. Similar tests have been made for us by the Pease Laboratories in a Fade-Ometer with auxiliary equipment for lowering the temperature and raising the humidity. Further tests will be necessary, however, before any definite conclusions can be reached concerning these improvements in the arc lamp.

We have also been co-operating with the British Research Association for the Woollen and Worsted Industries by exposing for them at the Bureau of Standards one of their sets of about 100 dyeings which we understand they are having exposed simultaneously and under identical conditions in various parts of the world.

Dr. Olney—Unfortunately, Mr. Christison, who is the Chairman of the Committee on Fastness Tests for Dyed Wool, and also of the Committee on Fastness to Perspiration, was called back to Lawrence last evening and he will be unable to present a report at this time.

President Killheffer—Mr. Cady, I should like to ask you just one question. I don't know whether I asked you this before, or not, but when I was visiting with Dr. Barker early this summer he showed me some results that they had obtained over there by exposing the same set of dyeings with considerable difference in the degree of humidity. Those seemed to prove very conclusively that humidity conditions have a great deal to do with the fading of colors. Have we made any tests along that line at all, as to where we can control the humidity? Do we check that result, that high degree of humidity makes colors fade very much more?

Mr. Cady—I might say that in our report already published and in the report soon to be published you will find quite a lot of data on that point.

Dr. Olney—There is one fact that I neglected to call to your attention concerning the Launder-Ometer: that each one purchased by a non-member gives a royalty of

10 per cent to the Association, and every one purchased by a member a royalty of 5 per cent. So any one who purchases a Launder-Ometer is doing a favor to the Association and the Research Committee at the same time.

I am going to call upon Mr. Appel and with him Mr. Smith to give a further talk concerning the Launder-Ometer, and also to tell you specifically what they hope to do in the way of a practical test some time during the day.

Report on the Launder-Ometer

Submitted by WILLIAM D. APPEL *and* WM. C. SMITH

MR. CHAIRMAN, the Launder-Ometer has already been described and a number of its uses indicated in an article published in the October issue of the AMERICAN DYESTUFF REPORTER. I don't believe that we need take time to go into that now, as the time is so short.

The features of the machine which particularly recommend themselves are, first, I should say, the ease with which a large amount of work may be turned out by using it; second, the control of conditions, washing conditions, afforded, and particularly the control of mechanical action; and, of course, the most important thing is the fact that the mechanical action is essentially equivalent in its effect on the removal of color or the removal of soil to that obtained in commercial laundering.

I might say that I have received no report from any one who has used a machine of this type adversely criticizing it. Every one seems to have had satisfactory results with it, but we are very anxious to hear if any one doesn't have good results, so that we can see whether there is any way in which we can improve the machine in its operation.

The machine is here and Mr. Smith will demonstrate it before the afternoon session, and he will perhaps have some tests done just before the meeting starts so that you can come and see it.

I think the machine speaks for itself.

Dr. Olney—There are several other sub-committees but as far as I know they have no reports to make at this time. If they do have reports, I should be pleased to hear from them. If not, that closes our part of the program. (Applause.)

President Killheffer—Are the tellers ready to report now? There seems to be some difficulty here about getting the ballots counted.

While we are waiting for the tellers to reappear I just want to say that as we have run off schedule this morning, I am going to ask that you get back here at a quarter of two, instead of two o'clock.

I should also like, while we are waiting for the missing tellers, to introduce to you the past chairman of the Philadelphia Section, Professor Bertolet, and the present chairman, Mr. Burke. I believe they want to extend an invitation, which will be conveyed in due course to the Council, with regard to the next meeting of the Association.

INVITATION FROM PHILADELPHIA SECTION

Prof. Bertolet—Gentlemen, the days go and the years go. They go too fast, for most of us, so it will be a very short time until the next meeting in December, 1929. We want you to meet in Philadelphia as you did four years ago. We feel that we can give you a good place for the meeting. It is a good city for conventions, as you know. All we can do is look forward to it, and ask you to prepare yourselves to come.

I thank you. (Applause.)

President Killheffer—The tellers aren't ready to report so we will adjourn and get back promptly at one forty-five.

. . . The morning session adjourned at 12:40 o'clock.

SATURDAY AFTERNOON SESSION
Conclusion of Business Meeting

President Killheffer—May we have the report of the tellers now, so that we can get the business over with?

Mr. Low—I don't know that it is the teller's duty to go any further than to announce who was elected and there were only two officers on the ballot for which there was any choice. The vote was as follows:

Total votes cast—403, three of which were rejected, because they were blank and two because they were confusing.

For the office of President, Dr. E. H. Killheffer received 387 votes.

For Vice President, W. S. Williams received 369; P. J. Wood, 371.

For Councilors for three years: W. R. Moorhouse, 374; W. M. Scott, 371.

For Secretary: Alex Morrison, 232; Joseph F. X. Harold, 145.

For Treasurer: W. C. Durfee, 275; H. R. Davies, 116.

President Killheffer—Gentlemen, you have heard the result of the ballot.

Mr. Williams, do you accept re-election as Vice President?

Mr. Williams—I do.

President Killheffer—Mr. Wood, will you stand up? Gentlemen, there is your new Vice-President. (Applause.)

Mr. Morrison, will you stand up? There is your new Secretary. (Applause.)

Winthrop Durfee is not here. Mr. Walter Durfee,

do you accept the office of Treasurer for your father?

Walter Durfee—Yes, sir. (Laughter and applause.)

And, gentlemen, I accept the job for another year. I don't want any more, though. (Applause.)

[*The technical papers and discussions which followed this business meeting will appear in an early issue.*]

EIGHTH ANNUAL DINNER

Saturday Evening, December 8, 1928

THE Annual Dinner, which closed the Eighth Annual Meeting of the Association, was held in the Providence-Biltmore Hotel, Saturday evening, December 8. P. J. Wood presided as toastmaster.

Mr. Wood was introduced by John Hutton, Chairman of the Providence Section.

Toastmaster Wood introduced the first speaker as follows:

Toastmaster Wood—The last time I had the pleasure of talking to you in this room, it was my duty to introduce to you the mayor of this city, a fine, upstanding gentleman, a good friend of all of us and I took the opportunity at that time to nominate him for a very high office. The nomination was carried unanimously but, unfortunately, he failed of election. So today I hesitate about nominating our next speaker to any office at all. I shall content myself with introducing His Honor, Mayor Dunne. (Applause.)

. . . Hon. James E. Dunne, Mayor of Providence, addressed the members, welcoming them to the city, and telling about some of its attractive features, etc. (Applause.)

. . . Toastmaster Wood thanked Mayor Dunne, and commented briefly on his talk. He then introduced the next speaker, as follows:

Toastmaster Wood—We were sitting here at the conclusion of the dinner, Dr. Killheffer and I, and the coffee came along. He said, "Well now, we will top off with a cup of coffee."

"Oh," I said, "not at night. Coffee is no night drink. Coffee is a breakfast drink."

He said, "I never drink coffee in the morning."

"Why not?" I asked.

"It keeps me awake all day." (Laughter.)

Anyway, I think you will find he is awake all night. I think he has been awake all day and night these last two days. I don't need to tell you what his office is in this organization. He is the President of our Association and has done wonderful work for us during the last year. He has ably carried on the banner so well and nobly borne by our former President. So I introduce to you our President, Dr. Killheffer. (Applause.)

Address by Dr. Killheffer

I HAVE had so much pleasure today, being up here in Providence, that I have really had almost enough for one day, so I am going to take but a very few minutes of your time now.

I should like to sell an idea to some member sitting out in the audience, and that is that this being President of this Association is just one grand, happy round of pleasure. I wish you would just bear that in mind so that there will be a little competition for this office (Laughter.)

First, as President of the Association, I should like to thank the Providence Section, Mr. Hutton, Chairman, and Mr. Culver, the Chairman of the Arrangements Committee, for the very lovely hospitality that has been shown to the Association during our meeting here, yesterday and today. I am sure that we have all enjoyed being in Providence again. I know that I have enjoyed it very much indeed.

The very kind words that Mr. Wood used in the introduction are, of course, more or less the usual method of introducing the head of any organization, but I want you to know that the work of our Association and any measure of success that we have had or that we shall have depends not on any one man, nor does any large percentage of it depend on any one man. The working body of this Association, as you know are the members of the Council and the members of the Research Committee, and I should just like to interrupt the proceedings a moment to ask the members of the Council who are present and the members of the Research Committee to stand up right where they are. I just want you to see who does the work. (Applause.)

The Vote on the Research Bureau

You all know the one subject that perhaps has been the one I have been most interested in for a year or more, and about which I have talked a good many times. I am not going to bore you with any long talk about it now, but I do want to say just a few words while I have this opportunity. The subject that I refer to, and that we have so often discussed is the establishment, in the name of this Association, of some sort of a research bureau. What form that research bureau is to take is in your hands entirely. We have grown to large proportions. We have accomplished quite remarkable things, when you consider that all the work of the Research Committee has been voluntary and done through meetings held once a month; but we have conceived of a plan of much larger and much greater activity whereby we can be of much greater use and greater benefit to the textile industry of the United States.

We have recently taken a vote among the membership as to how our own members felt about the establishment of such a bureau. There have been many expressions, some favorable and some not favorable, and some noncommittal. The great majority of them, however (in fact, the vote was about 9 to 1), were favorable to the idea.

There were a few comments made by several who voted "No" which, while I am not inclined to take them seriously, made me feel as though I should like to take this opportunity to set the matter straight. Several of these comments were to the effect that this idea was not looked upon favorably because it was too much of a dyestuff man's proposition.

If you stop to think about it, that conclusion is obviously ridiculous. The dyestuff man has nothing in the world to gain by the establishment of this bureau. It may be unfortunate that I, as a dyestuff man, suggested the idea, but we have gotten to the point now where I feel constrained to take this position: I have suggested to you, to this Association, an idea for the establishment of some broader activity in a field that, I believe it is agreed by authorities in and out of the textile industry, is much needed, and that activity is some fundamental research. That is solely for the benefit of the textile industry. The dyestuff industry must do its own research. It recognizes it as part of its regular budget of expense. It realizes that without research it could not continue to exist. Therefore, in this particular thing the interest of the dyestuff fraternity is solely one of helpfulness, and that is all.

The proposition is, as I say, wholly for the textile industry, and I have given some thought today particularly to the appointment of a committee, a fairly large committee, taking in prominent men in the textile industry from our Association, some men prominent in the textile industry from without our Association, and some other men connected with some of the larger textile publications. My idea is to pass over to them this idea as we have discussed it so far, and let them take it and do with it what they will, because, once and for all, I want it to be known that this is a textile proposition solely. The rest of us, as I say, are deeply interested in it. I am, personally. I think it is something that ought to be done. It is being done in Europe. We shouldn't have neglected doing it so long in the United States. It will be done sooner or later by some one. Why not by this Association, which is the proper body, after all, to put over such a thing as that?

That is all I am going to say on the subject of research. Now you know what I had on my mind on that subject.

Before I sit down, I want to pay a word of tribute to our retiring Secretary, Mr. Hadley. He has been Secretary of our organization since its inception and he has been a faithful worker throughout the whole of that time. He has been deeply interested in the work of the Association, of necessity, or he wouldn't have carried on for the length of time that he has. It was thought by a number of the members that some fitting testimonial should be offered to him, not by way of compensation, because we realize that financially we are not in position to adequately compensate those who do good service for us, but, Mr. Hadley, we do expect in the near future to have some token for you that we hope will convey to you the high esteem in which all of us hold you.

I have been asked also to mention the fact that the next meeting and the next annual dinner of this Association will be held in Philadelphia, and we would like you to make your plans to get down there and meet with us again next year.

Thank you very much. (Applause.)

. . . Toastmaster Wood introduced the next speaker, Geoffrey O'Hara, who addressed the gathering in a humorous vein, and then entertained with songs of his own composition, and others. . .

. . . Toastmaster Wood commented humorously on Mr. O'Hara's performance, before introducing the next speaker, as follows:

Toastmaster Wood—Just as we heard from His Honor, the Mayor, representing the government of the city of Providence, we shall now hear from Mr. Richard B. Watrous, representing the commerce of Providence.

Mr. Watrous. (Applause.)

. . . Mr. Watrous extended greetings to the convention and commented on the benefits accruing to the city from such conventions being held within it. He mentioned that it was quite fitting that the Association should meet in Providence, since New England was the great textile manufacturing section of the country. He also expressed the hope that the Association would meet in Providence again in the near future. . . .

Toastmaster Wood—The next gentleman I am about to introduce is one of whom I cannot speak too highly. He served this Association ably as its president up to the beginning of last year with a faithfulness which can never be exceeded and which it will be difficult to equal. He is a man who has carried on against discouragement, against criticism, against criticism meant to be constructive, I suppose, but which did not reveal itself as such, against all odds. He has kept us going. He has seen the growth of this institution from, I believe, about 140 charter members to its present size of about 1,100. He is a man who is not easily swerved from his purpose and his purpose has served us very well during a great many years past, and I hope will continue to, as Chairman of the Research Committee for a good many years to come.

Dr. Olney. (Applause.)

Address By Dr. Louis A. Olney

MR. TOASTMASTER, Fellow Members of the Association, and Guests: Several weeks ago, in a conversation with some of my associates who were actively engaged in arranging the program for this evening, I was solemnly and sincerely promised immunity from any attack of the after-dinner speaking bacillus this evening. Therefore, when I received the envelope containing this program in the mail several days ago, after seven years of this pre-banquet agony which the Toastmaster has spoken of, I settled back in my chair to read the program in peace and quiet. My contentment was soon turned to dismay, and I might say despair, when I saw my name in the midst of an otherwise very excellent list of speakers for the evening.

The next thing I noticed was that it said at the top of the list, "Speakers and Entertainers." At my best, I certainly could not possibly pose as an entertainer. Looking back to my youth, I could think of but two things that I ever did that seemed to cause any entertainment. As a boy, I remember I was called upon very frequently by my companions to do one of two things. One was to tickle the end of my nose with the tip of my tongue, and the other was described by the audience as "spitting like a snake." (Laughter.)

I am sure that neither one of these would be acceptable in this refined audience this evening, and if I should attempt these, it is so long since I practiced them, that I doubt if I could do them. Furthermore, my nose has increased somewhat in length since that time, and the dentist has proceeded to fill my mouth with bridgework, so we won't consider that any more.

Not being able to qualify as an entertainer, I thought I would accept the lesser of two evils, and enter as a speaker. Having done that, it was a difficult matter to think of any subject that I could speak upon, because in the last seven years I have exhausted my limited supply, and I felt that I was in the position of the blind man who was sent into a dark room to hunt for a black hat that wasn't there. Like the blind man, I finally had to give up hunting, and I thought I would simply say a few words this evening on the subject of book-making.

Book-Making

I see some smile at that subject, particularly those who live around New York. But I am not referring to the kind of book-making they are thinking of. The book I am going to talk about is this one right here, which is our 1928 Year Book. Supposedly, it should have been in your hands by this time, but it will not be long before you all have one.

Most of you in a general way are acquainted with the contents of this book, but I do not believe you realize the amount of anxiety, the amount of time and effort that is put into it by a great number of people.

As we open up the book, the first thing that really appeals to us is the vast number of advertisements which it carries, and in that connection, I thought as our Toastmaster was speaking of the various qualifications of the ladies, and so on, that if I were to offer a toast to our advertisers I could use no better one than the one frequently offered to the ladies: "Bless their hearts! We could not get along without them." In other words, no advertisers, no Year Book. We have something more than 80 who help us out in this way, and the net result is that those ads, with the very excellent management of Mr. A. P. Howes and the efforts of Mr. Hoagland, have each year paid entirely for the Book. Not only that, but a net profit of several hundred dollars has been returned to the Association, for our work.

The only page in the Book that has not been changed since the introduction of the Year Book in 1923 is the one at the very beginning which gives the Objects of the Association.

Rare Photographs

As we pass along over the Foreword, we come to our list of officers. Sometimes the pictures which accompany that list have been derogatorily spoken of as the "rogues' gallery," and I presume that is true, to some extent. If I had the wit and the ability of Mark Twain, I could entertain you for half an hour telling you the experiences we have had in undertaking to get these photographs for publication from these various officers. In some cases, it appeals to their pride and they are very glad indeed to send them. In other cases there is a hesitation which seems to develop a sort of subdued inferiority complex, for some reason; and with some, this getting out a photograph and sending it along for publication seems to be almost a ritual. But we have always been able to get them, although in one case we had to resort to a snapshot at the last minute in order to fill up the particular space. Thirty or more have been provided in that way.

With some of the "old guard," whose pictures have been in here every year, that is a simple matter, because once we get hold of a picture, that is the end of it. They have no more to say about it after that. We use it as we see fit.

With regard to the various reports of the local sections, there is often difficulty in getting those on time.

I might say that the work on this book began last April, and we have worked on it almost continuously ever since, you might say every day, but even at that, we are a little bit late in its publication, just about two weeks, because at the last minute a final effort was made to make

certain portions of it a little more satisfactory, complete and accurate.

The report of our Research Committee, of course, occupies quite a portion of the book, having expanded to somewhat between 50 and 60 pages in the present volume. I shall not go into any detail about that. There is just one thing that occurs to me, though, at this time. There is in here a rather complete description of our Launder-Ometer. I don't know that I ever posed as a salesman, and I am not going to pose as one now, but I will say that the Atlas Electric Devices Company have kindly sent us one of the Launder-Ometers for use here today, and it stands right over by the piano. We either have to send that back or secure a customer for it. If any of you are interested or will be interested in the near future in ordering one of these Launder-Ometers, I wish you would get in touch with some member of the Research Committee, or with me. I say that now because there are more present than there have been at any one time during the meeting and I wanted everyone to hear it.

Our dyestuff list is one of the features of this book which has been quite acceptable to everybody, the dyestuff distributors and also the users of dyes, and, as you all know, it is one of the most complete lists of dyes, especially American-made dyes, that can be found. That list has been increased quite a little this year.

One of the difficulties in getting a correct book is the list of members. There are over 1,000 members of the Association, and if our list was accurate tonight it wouldn't be tomorrow night, because by tomorrow some-

Members of the American Association of Textile Chemists and Colorists Gathered in the Ballroom of the Biltmore Hotel, Providence, R. I., for Their Eighth Annual Dinner

one will have moved somewhere and his address will have been changed. But this year we have put it at the end of the book, hoping to make it in that way a little more accurate and up-to-date.

As chairman of the Committee on the Publication of the Year Book, I wish at this time, to extend the thanks of the Association to our advertisers, who as I have already said have made it possible to publish the book, and I wish particularly to extend thanks to one of the members of this Committee who has done a great deal of work. He has worked nights both in checking up the dyestuff list and in proof-reading. I refer to William H. Cady.

Believers in evolution like to tell us that we all ascended through the monkey family. I think that sometime we may make a mistake in this respect. Mr. Cady, who has helped so much in regard to this Year Book I am sure developed through the ferret family. He has greater ability for hunting out mistakes and errors than any man I know. In that way, he more than anyone else has helped to make this book as nearly 100 per cent accurate as it is humanly possible to do it. We don't claim that it is 100 per cent accurate. We will have all kinds of errors pointed out to us, undoubtedly, within a week or two after its publication.

This time there will be a book of well over 300 pages. It is gradually growing. But there is always one thing we have to keep in mind. We would like, perhaps, to make the book larger, but we have to strike a proper balance between the advertising and the text material and the editorial matter. If one exceeds the other too much, the book could not be published, even at a profit, but would be published at a slight loss. As time goes on, and we receive the support of our advertisers, we can increase the size of the book, and we hope to continue its publication, and the Committee will be glad to receive any suggestions in regard to future issues.

Even the color of the cover has its history. The first year it was blue, the second brown, but before the third one was published there was considerable discussion as to whether or not it would be better to have a different color each year, so that the current volume could be easily recognized, or for the sake of uniformity to use only one color. When put to a vote the latter prevailed, and for three years the color was brown. Last year, however, it was decided that different colors would be more convenient, it was changed to red, and this year it is to be green.

I have gone into this detail hoping that when you take this book out of the mail in less than two weeks you will be better acquainted with it, and as you look it over perhaps you can get a little more interest out of it from knowing a little about the various difficulties which enter into its publication.

I thank you, Mr. Toastmaster. (Applause)

. . . Toastmaster Wood introduced Malcolm MacGregor, who entertained the gathering with songs and humorous stories. . .

Toastmaster Wood—Well, gentlemen, I hope you have had an enjoyable time. We have up here at this table and we hope you too have.

Another chapter has been written in the history of the American Association of Textile Chemists and Colorists. Another year has come to a close. We are at the beginning of a new year. This year, instead of trying to get all we can out of the Association, I hope some of us may be inclined to see what we can put into it.

As the concluding number, I would ask you all to rise and sing one verse of "America."

. . . The dinner closed at ten-twenty o'clock.

FIFTIETH RESEARCH COMMITTEE MEETING

THE Fiftieth Research Committee Meeting was held in the Biltmore Hotel, Providence, R. I., Friday afternoon, December 6, 1928, with Prof. L. A Olney in the chair.

The following members were in attendance: E. H Killheffer, W. S. Williams, Joseph F. X. Harold, L. A Olney, W. M. Scott, R. F. Culver, W. R. Moorhouse, H. Christison, G. A. Moran, Walter C. Durfee, W. H. Cady, John Hutton, Charles E. Mullin, W. D. Appel, H. Meyer, H. D. Clayton, W. C. Smith, E. C. Bertolet, H. W. Leitch, P. J. Wood, P. F. Ripley, Karl R. Moore and W. E. Hadley.

The Chairman stated that arrangements with the Atlas Electric Devices Company for the manufacture and distribution of the Launder-Ometer were practically completed. A number of the Launder-Ometers had already been sold, and the manufacturers were now in a position to make deliveries promptly.

Messrs. Moran, Appel and Olney, who constitute a committee to prepare a pamphlet giving specific directions for the use of the Launder-Ometer in making washing and laundry tests, reported that material for such a pamphlet was ready to forward to the Atlas Electric Devices Company. They further reported that the methods recommended were based upon the Standard Methods already published in the Year Book, but had been slightly modified for adaptation to the Launder-Ometer and for the sake of simplicity.

The Chairman called attention to the fact that at his request, the Atlas Electric Devices Company had kindly sent a new Launder-Ometer for exhibition, and that practical demonstrations of it would be given during the Annual Meeting.

It was reported that some difficulty had been ex-

perienced in quickly bringing the water in the Launder-Ometer bath to any desired temperature. The possibility of an additional burner was suggested; also the possibility of connecting the outlet valve so that steam might be introduced when necessary to raise the temperature. It was stated that a large ring burner had been very successfully used in one case, and in another case, a steam coil had been introduced. It was reported that this matter had already been taken up with the manufacturer and steps were being taken to improve the method of heating. It was believed, however, that this was largely a matter of local adaptation of steam or gas, and might readily be taken care of by each purchaser of the machine.

It was furthermore stated, that where possible much time could be saved by introducing water into the Launder-Ometer which was already at approximately the desired temperature.

The Chairman went into considerable detail in discussing future plans for the Research Committee, and pointed out that the response of members on the Questionnaires sent out last spring as regards suggestions for future work of the Research Committee had been extremely disappointing.

In this connection it was recommended that a general survey should be made of the various activities which would prove of greatest value to textile manufacturers, and to the membership at large, and that such a survey might serve as a guide for future programs.

A Bibliography Proposed

The Chairman also stated that a study of existing literature along the lines of textile chemistry and dye application was being made, and that it was the plan, beginning with the 1929 Year Book, to publish a bibliography of the whole field of this type of literature, and follow that each year with a bibliography of new publications.

Dr. Killheffer referred to the Questionnaire which had been sent to each member of the Association, in an effort to obtain an expression of opinion in regard to the proposed Research Bureau. Disappointment was expressed that a greater number had not responded, although the large majority who did respond were favorable to the formation of such a bureau. Dr. Killheffer stated that he was about to appoint a committee of twelve men, within and without the Association, to see just what specific steps could be taken to bring this matter to a definite conclusion.

The opinion was expressed by several members that, if commercial work was to be done by the proposed Research Bureau, it should be simply with the idea of helping to defray the expenses of its operation, and that the fundamental and ideal work of such a laboratory should be of a scientific and technical character, and should supplement and assist in the development of the program of the Research Committee. The opinion was also expressed that the work of such a laboratory would be more fittingly for the carrying out of special investigations for the textile industry, than for the carrying out of routine work.

Dr. Walter M. Scott and William D. Appel were named as members of a committee with authorization to secure a third member to make a survey of the work which had been done up to the present time along the line of color standardization and measurement, particularly with reference to the various means of specifically recording color for comparative and reference purposes. This committee was also asked to formulate a definite program for the Research Committee in connection with this particular subject.

Professor Olney, Chairman of the Year Book Committee, reported that the 1928 Year Book would undoubtedly be in the mail within a period of two weeks, and that the delay had been caused by certain revisions and additions to the dyestuff list. While the late date of its publication was regretted, it was the opinion of the committee that the delay would be well compensated by a more complete and accurate Year Book.

W. E. Hadley, *Secretary.*

NOVEMBER MEETING OF THE RHODE ISLAND SECTION

The November meeting of the Rhode Island Section was held on Friday evening, November 21, at the rooms of the Providence Engineering Society.

John Hutton, Chairman, presided.

Dr. Charles A. Kraus, Professor of Chemistry and Director of Research at Brown University, delivered a most interesting address entitled *"The Modern Conception of Matter"*. This address is published below.

Sixty-five members and guests were present.

Albro N. Dana, *Secretary.*

The Modern Conception of Matter

By Dr. Charles A. Kraus

Professor of Chemistry, Brown University

MR. Chairman and Gentlemen: I find myself in something of a dilemma, somewhat after the fashion of the policeman down on Weybosset Street a little while ago.

A car pulled up to the curb and the driver asked, "Can I park here?" The policeman thought a minute, then he said, "'You had better drive on and see if you can find another officer. My beat is on the other side of the street."

I don't believe I am going to tell you anything tonight of what is on your side of the street. I am going to confine myself to what I am a little more familiar with, and if you want expert advice you will have to wait until another meeting because I admit that is a little off my beat. Of course, in these days the textile industry seems to be more or less fair game and everybody likes to shy something at it. Something is always wrong with textiles and it is held up as an example of backwardness and what not. I am not inclined to think this is entirely true for probably there is no industry which is more difficult to get at, no industry in which some of the fundamentals are more deeply hidden, than the textile industry.

Textile fabrics are a complicated sort of thing, but obviously in a textile fabric you have to deal with, in the first place, the properties that more or less permeate the whole fabric. Then you have to consider the surface. You have a complicated problem and unfortunately we do not know what the compounds are with which we have to deal. The tools that must be applied in order to determine what these things are with which we are dealing hold out the greatest promise of development. The tools at the disposal of chemists today are rapidly becoming more and more refined. There never was a time when we had available such keen instruments. Of course, you cannot apply them immediately in all cases but it is interesting to note that even in the case of textiles we can get some ideas of structure: for example, by means of the X-rays; and textile fabric, we know, is no longer a structureless sort of thing. It has a structure. I use that merely by means of an illustration and to introduce the subject upon which I am to speak tonight, that is, some of the notions we have today regarding matter.

Our Greater Knowledge of Atoms

There has been a tremendous development in the fundamental conceptions underlying physical science during the past twenty-five years. Not very long ago, ten, fifteen or twenty years, an atom or a molecule was a more or less round, hard sort of thing and we had no notion of what was inside of it. Today the situation is entirely reversed. We know more about the structure of the atoms themselves than we know about the manner in which the atoms are put together. Apparently progress is going to come from inside out and not outside in, and as our knowledge of the atoms increases, without doubt we shall get a much clearer notion of the manner of chemical combination. A good deal of progress has been made in that direction already.

In the first place, we now have means for determining the arrangement of atoms in space, not always in the case of substances in the liquid or in the vapor condition, but more particularly in the case of substances in the solid conditions. We have the means and the means are the X-rays, for determining how, for example, the atoms or molecules in a crystal are arranged. We can tell how far apart they are located and how they are related to one another. That, of course, represents tremendous progress particularly in an industry where what used to be the most difficult state of matter now becomes the simplest.

We know more about solids now than about any other kind of substance. Solids are particularly simple. The kind of solids that are most simple, aside from the elementary substances—particularly the metals—are the salts. Simple salt-like bodies like sodium chloride always crystallize in a definite way. Take sodium chloride; we know that if this represents, for example, the chlorine constituent, there is located within it the sodium constituent. It is what is called a space lattice. In other cases the lattice may become more complex. There are very simple lattices. That represents a different arrangement of the ions; that is to say, the fundamental constituent substances that go to make up the salts are not the atoms but ions. We have here not sodium atoms and chloride atoms, but sodium ions and chloride ions.

I am trying to review briefly now some of the conceptions which have been definitely established; I am not speaking of hypothetical things. Not many years ago there was a good deal of doubt as to whether or not the ion really existed, chemists argued at length as to whether or not there was such a thing. Today we know the ions form the fundamental constituents of all salt-like substances. Of course this relates so far to the coarse structure of matter. The ions of which I am speaking are relatively large. They have dimensions of the order of 1×10 to the -8th power; that is to say, one divided by ten centimeters. That is the order of magnitude of the ordinary ions. Most of them will be a little larger. The dimensions may run up to as high as five or ten to the -8th power. That represents matter in a relatively coarse condition. That is not the ultimate structure of matter.

The Simplest Atom—Hydrogen

Actually we know today that all the atoms are composed of two main parts, two fundamental constituents, the nucleus of the atom and the electrons. Practically the entire mass of an atom is concentrated in a very small volume which we call the nucleus. The simplest atom is hydrogen; hydrogen consists of a single nucleus which carries a single quantitative charge; surrounding this

nucleus is a single electron carrying a single negative charge. The dimensions of the nucleus are extremely small; the diameter of an atom of hydrogen is of the order of 1.08x10 -8th power. One-half of that distance represents substantially the distance between the electron and the nucleus, 1.054 -8th power. The nucleus itself is exceedingly minute; its diameter is not above 5 x 10 - 13th power, so that the ratio of the diameters of the nucleus and of the atom as a whole is as 1.08 x 10 - 8th is to 5 x 10 - 13th. In other words, the diameter of the hydrogen atom is about twenty thousand times as great as the diameter of the main portion of the atom, that is to say, that portion of the atom that carries the mass. To get an idea of the distances of the electron and the size of the nucleus, bear in mind, for example, that the earth's orbit is about 93,000,000 miles and the diameter of the sun is 900,000 miles, round numbers. In other words, the ratio of the diameter is the orbit and that of the sun about 1 to 200. The diameter is in this case a thousand times as great as the atom.

The great difficulty that bothered physicists for a very long time, up to very recently in fact, in connection with the constitution of atoms was that if the electron is charged negatively and the nucleus is charged positively, why don't the two come together and neutralize each other? That is, if you have here a nucleus carrying one positive charge and a nucleus carrying one negative charge, what is keeping them apart? Because there is, you know, acting between them a force which is equal to the product of the charges divided by the square of the distance. It is a very small distance we have in the case of hydrogen atoms. The force becomes very considerable in proportion to the amount of matter with which we have to deal. What is keeping them apart?

That is the difficulty, and was solved in this way: The electrons are in motion around the atom in a circular or possibly in elliptical orders. That did not completely solve the problem because even if the electrons were in motion around the nucleus, as soon as the electron radiates energy, any charge in motion gives a magnetic appeal, and that necessarily radiates energy; and the question was, Why does not an electron radiate energy moving around an electron? That would contract and the two charges come together. No progress was made in the mechanics of the atom until this difficulty was overcome.

I am not going into the theory of this thing—it is not necessary. But the following hypothesis, which is very simple, has been overwhelmingly substantiated by the fact that an electron moving in a certain orbit is not capable of radiating any energy at all. If an electron occupies a certain orbit whose radius is equal to 0.54 x 0.10 - 8th centimeters, that electron is not capable of radiating any energy. We don't know why this is. It simply is an established fact. Furthermore, it is possible, of course, to remove the electron from its orbit. That is comparatively a simple thing to do because all you have to do is bombard the electron; that is simply producing an electron that moves with more or less speed. This electron may be removed entirely outside the atom. If it is removed to a great distance, relatively—it wouldn't have to be very far, one-tenth of a millimeter—the force would be insufficient to have very much effect.

How the Electron Acquires Energy

Now here is the point of the case: If an electron were to come along somewhere in the neighborhood of this atom, what would it do? If it comes within any reasonable distance of this positive charge, it will proceed to move toward it. What happens? It is found that such an electron gives off energy. You see, as the electron approaches the positive charge it will, of course, acquire velocity, and in virtue of the acquired velocity it will acquire energy. Suppose it approached at an angle like this (illustrating); we might suppose the electron will get into such an orbit. As a matter of fact, what happens is this: as the electron approaches the nucleus, it passes through a series of orbits, any one of which it may occupy for a considerable time. I will reduce the scale of the figure. If this represents the nucleus (illustrating on blackboard) and this represents the first orbit (illustrating on blackboard) whose radius is equal to 0.54 x 0.10 - 8th centimeters—an electron may occupy a number of orbits which may, as a matter of fact, be circular for the moment. It may occupy a series of orbits. If an electron strikes that orbit it may stay for a considerable time—it is very short, only 1/10 millionth of a second—but it is a relatively long time. An electron rotating around the nucleus in an orbit such as this would pass around that orbit a great many times in one ten-millionth part of a second.

As long as an electron is moving around these orbits, it is not radiating any energy, but if an electron from one of these orbits falls into one of those further in, the difference in the energy between these two orbits is radiated, that is, given off in the form of radiation. It may be in the form of a visible life or in the form of radiation, homogenous radiation having a definite and a single frequency, but it is always in the form of radiation.

There is a definite relation between the energy of an electron, between a pair of these orbits and the frequency of the radiation. It is such a simple sort of relation that I might indicate it on the board. The energy or the radiation E is equal to Nu—is the number of vibrations that the electron makes per second. The constant H is a universal constant—6.5 x 10 - 27th power. It is a pretty small number, as you can see, yet that is one of the most important constants of matter. Here is a remarkable thing.

All radiations between or transformations between radiations and the energy of electrons or atoms, or the reverse; the transformation of the energy of motion of an electron, for example, into the energy of a radiation, conform to this very simple law: the energy which that moving charged particle undergoes is taken up in the form of a radiation whose frequency is given by that very simple equation.

It is a universal relation, one of the most fundamental relations there is. Here is what it amounts to: an electron moving around the nucleus of an atom may occupy a series of orbits for a short space of time. If the orbit is not the orbit of smallest diameter, then, in general, the electron will not occupy an orbit permanently. It will fall into an orbit further in and will radiate a certain amount of energy.

Here is a remarkable thing about these orbits that is very simple. The diameters of these orbits bear a simple relation to each other. Call the diameter of the first orbit D1 and the next D2 and so on. The orbits bear to each other the relation or are in proportion that D1 is to D2 is to D3 and so on, as 1 squared is to 3 squared, etc. If you call the diameter of the first orbit in round numbers 1 x 10 - 8th power, then the diameter of the next orbit is four times that of the first, and the diameter of the next orbit is precisely nine times that of the first, and so on. The diameters of these orbits are very well known. As a matter of fact, some of these orbits are not always circular; some are elliptical. We can have the two kinds. If they are ellipticals they are in a very simple form. The element for which the orbits can be only circular is hydrogen. The next orbit can be a little more complex. There are two different kinds of orbits in the next lot. In the case of the next orbit whose main diameter is four times that of the first (illustrating) you can have a circular orbit having four times the diameter; or you might have an elliptical orbit which would have a main diameter of four and a minor diameter of two. Those would be the only orbits possible.

In the second set there are two possible different orbits. In the third set of orbits there are three corresponding. The major diameter always corresponds to the relation 1 to 2 to 3 squared. The minor diameters are simple fractions of the main diameters. In case of the fourth, the ratio of the diameter 1 to 4, 2 to 4, 3 to 4, and 4 to 4, that 4 to 4 would be a circular orbit. The greater the diameters become the greater the number of orbits that the electron may occupy.

There is this important fact: it is a simple matter to determine the energy of the electrons in these different orbits. All we have done to determine the energy of the electrons in these different orbits is to photograph the spectrum of the atom. From the spectrum of the atoms it is possible to determine what the electrons are doing and, in particular, it is possible to determine definitely their energies in the different orbits.

The Basic Relation Between Elements

To proceed to the elements a little more complex than hydrogen, the simplest possible element. What is the nature of the heaviest elements? Are they similar to hydrogen or in what respect do they differ? Here is a fundamental relation as regards the elements. The charge on the nucleus of the elements increases in a regular fashion as you pass through the periodic system of the elements; that is to say, the first element is hydrogen which has simply one positive charge on the nucleus. The next element is helium; it has two positive charges on the nucleus. The next lithium, the next beryllium which has four, boron five, carbon six, nitrogen seven, oxygen eight, fluorine nine, neon ten.

These are the first ten elements in order beginning with hydrogen. The charge on the nucleus can be determined directly. There is not any question on the charge. The manner in which we arrive at the charge on the nucleus in a simple fashion is by a study of the X-rays. You know the X-rays representing this radiation are of precisely the same nature as light. If you have a homogeneous radiation you can determine its frequency. So in the case of the X-rays: you will find they have frequencies. If you subject matter to any action of the hotter X-rays or to rapidly moving electrons, then you find X-rays are given off by the elements. These X-rays that are given off are of the nature of light; that is to say, they consist of a simple line spectrum. You know what it looks like. If you take a photograph it has a few lines here and toward the side of the shortest wavelength the spectrum approaches a limit. On the other side it proceeds to a certain length and then stops. In the case of radiations which are given off by the various atoms when submitted to the X-rays, they are precisely of the same general character. They consist of a few lines. In the case of X-rays, they consist of only three or four lines in many instances.

The frequency of these lines is related in a very simple manner to the position of the element in this series. As a matter of fact, if you were to apply the square root of the frequency of the radiation, a certain particular line—take the longest line here—against the number, number 1 - 2 - 3 - N or 92 in the case of radium—you will find these points lie on a perfectly straight line. There is a simple relation between the frequency of the X-ray spectra and the position of the element in the periodic system in sequence, and these points actually lie on a straight line. If an element happens to be missing in between—if this

represents, say, the number 60 and element number 61 is missing—and suppose you didn't know 61 was missing but you know element 60 and you knew the next heavier element—the point would come at that point for responding to 62, and 61 would be left vacant.

That is the method that was employed in establishing the actual existence of the only element discovered in America, namely, illinium, discovered at the University of Illinois. A certain element was fractionated out from among the various elements of the rare earth's. In order to establish the fact whether it was the missing element 61 or not, they examined the X-ray spectrum, got the frequency of the line, and put it on this plot, and finally it filled where it should, corresponding to 61.

The Simple Integers in Chemistry

It is a rather interesting fact that in modern chemistry we have got down to dealing with the simple integers, 1 - 2 - 3 - 4, etc. These integers are playing an extremely important role in chemistry. There is something important about them from the standpoint of physical phenomena. The mass is always concentrated in the nucleus. The diameter of the nucleus of uranium is not much larger than the radius of radium. The nuclei of many elements is not greater than 1.10 - 12th centimeters; even in the case of the very heaviest elements the nuclei are extremely minute. It may seem strange the mass should be concentrated in so small a point. That is pretty well an established fact.

It is possible to approach the problem of the size of the nuclei directly. It is very simple and very direct. If that represents an atom, you bombard the atom with very rapidly moving particles. These particles are the nuclei of the helium atom and are moving with the velocity of one-fifteenth that of light. If a helium nucleus is moving with a high velocity, if the atom were solid or if most of the mass of the atom were distributed through the diameter, then, of course, in passing through the mass of the atom the particle would be considerably slowed up. But that isn't what happens. Suppose this represents the center of the atom. If an alpha particle travels through the atom in the direction indicated by the arrow, it is found that it is not deflected at all; it doesn't undergo any change whatever. It is only once in a long while when the alpha particle comes extremely close to the nucleus that deflection occurs, and in most cases deflection occurs from a very large angle.

If you could put a lot of these particles together without the electrons, could pack the nuclei together, you would have extremely dense matter. If you could fill a pint measure with the nuclei of hydrogen—I forget what the exact value is—it would weigh something like four or five hundred billion tons. You know, there are certain stars that have densities that run about as high as sixty thousand. Matter does exist in a more dense condition than we know it on the earth. There is such a thing as a star having a density of sixty thousand. That indicates, of course, that matter presents only an incomplete picture to us. There is a lot more to matter than we see on this earth.

In order to see what matter is we have got to pry into the internals of it, so to speak. We do the prying by means of these rapidly moving electrons or alpha particles. As a matter of fact, the alpha particles move so fast that in the case of the lighter elements it is possible to knock part of the atom's internals out. In other words, it is possible to carry out in that way a controlled transportation of the elements. You can't make gold out of mercury, but it is possible to make hydrogen out of aluminum, in minute quantities that you can count the number of them. If a rapidly moving particle happens to strike the atom of aluminum just right, then a particle of hydrogen —that is, a nucleus of hydrogen—is projected right out of the atom of aluminum. I say that merely to indicate how far it has been possible to proceed in this direction. It certainly is a remarkable achievement, to be able to show that the mass of the particles is concentrated in such a small volume; and, furthermore, to be able to knock out of that highly concentrated mass certain portions that we can definitely recognize.

Structure of the Atom

To proceed just a little further with the ideas of the structure of atoms: The atom is really divided into three main parts. I have already mentioned, in the first place, that the atoms consist of a nucleus. In the innermost part of the nucleus is the atom which carries the entire mass, which carries a definite positive charge, a charge which we will call N-plus. The atoms themselves are neutral. Surrounding the atoms are indifferent electrons, in motion around the nucleus in definite orbits. So far as we know, an electron can never get any nearer to the atom than corresponds to these most stable positions. You can divide the various positions that the electrons may occupy into a series of orbits. They are not all circular; some are elliptical. You can divide these electrons into a series of orbits whose energies are the same. In the first, called the K-orbit, you have about the same energy whether they move in ellipses or in a circle. In the next, or the L-system or orbits, they have again the same energy, and those also in the M-system of orbits. All together there are 1, 2, 3, 4, L, M, N, O, P, Q. In the heaviest atom—namely, uranium—whose atomic number is 92, which carries 92 charges on the nucleus, the electrons are distributed among altogether seven different systems of orbits.

The number of electrons in these different orbits is not the same. The maximum number of electrons that may occupy a position in a given orbit is limited to two in this case, and it is limited to eight in the case of that system of orbits. In the next system it is limited to fourteen. There is a definite limit to the number of electrons that can occupy positions in the different systems of orbits. The total energy which these electrons possess in the different orbital systems is the greater the further these electrons are located from the nucleus or the greater the diameter of the orbits. In other words, the energy necessary to remove the electrons will be the greater the nearer the orbits lie to the nucleus. The outermost electrons are removed most readily and it is these electrons that determine the chemical properties of the elements.

It is, of course, obvious that if the chemical properties of the elements are determined entirely by the electrons of the extreme outside, the chemical properties will be the same quite irrespective of the mass of the nucleus, because the number of electrons is determined by the charge on the nucleus; so that we may have an atomical species having the same properties but having different weights. We know, as a matter of fact, about half of the elements are not simple substances but are mixtures as, for example, chlorine; it is a mixture of two atomical substances. The reason why the atomical weight of chlorine is 35.46 is that it is a mixture of these two elementary substances but having the atomic weight of 35 and 37.

Elements of this kind which have the same chemical properties but different atomic weights are called isotopes. That is another well established fact. The atomic weights of the various isotopes have been precisely determined and the relative proportion in which the different isotopes occur have been pretty accurately determined. Here is a very interesting thing. You know, of course, that originally Prout set up the hypothesis that all elements were built up of hydrogen because he said the atomic weights of all of the elements can be expressed as a whole number as multiples of the atomic weight of hydrogen. But when they came to investigate it they found it didn't work out that way.

What is actually found is that the atomic weights of all the elements approximate extremely closely to multiples of 1/16th the atomic weight of oxygen. They are multiples of the atomic weight of hydrogen but 1/16th of the atomic weight of oxygen. That is apparent at once when we consider the atomic weights not of the mixed elements but of the purely hydropathic components of the elements. These atomic weights can be accurately determined by physical means. There is therefore something in Prout's hypothesis after all, and it is now assumed that all the elements are in fact made up of hydrogen.

Hydrogen in All Elementary Substances

Hydrogen is the ultimate building constituent of all elementary substances. There is a little discrepancy between the atomic weight of hydrogen—1.008 and the atomic weight of oxygen. That remains, of course, to be explained. Why is it that hydrogen is not as heavy as oxygen? The reason for this seems to be that the atomic weight of any substance depends upon its energy or rather the mass of any substance depends upon its energy. If you pack together a mass of hydrogen nuclei, it is possible to get a certain number of electrons; it is possible there is a certain loss of energy, and if there is a certain loss of energy, the mass will be smaller than it appears to be. There is a very good reason for believing that view is correct. In which case we find, then, that ultimately matter is constructed of simply two things: of the nucleus of the hydrogen atom which is called the "protone," and which is nothing but a positive electrical charge, and of the electron. That is all there is to matter fundamentally; and all the elements whatsoever and all matter, however complex, is built up of these units: electrons and protones.

The interesting problem is, of course, to find out how these electrons and protones were put together, and we have a fair notion of how certain electrons are related to the protones and form the nuclei. They are distributed in definite energy levels, the value of which are accurately determinable. The energy levels are associated with the electrons in these different systems of orbits and represent the known and fundamental facts of the case. It does not make any difference what kind of a theory we may set up regarding the structure of the atom. We do know that within the atom there are certain different levels associated with the electrons. Only the outermost ones are concerned in chemical reactions. The inner electrons are entirely inert. They take no part whatsoever. We become aware of the existence of these electrons in the inside of the atom, the inner orbits, as we call them, when we subject them to the X-rays or to the action of the alpha particles or rapidly moving electrons. Then we can remove these electrons from the inner levels quite readily, and when the electrons from the outside fall into the inner levels as they do, they give off the X-rays. By means of a study of the characteristic spectra of the various elementary substances it is possible to find out how the electrons are arranged in all these different orbits. By and large the nature of the atoms is now pretty well understood.

On the other hand, the nature of the chemical combinations between the atoms is a much more complex problem. As yet it is very imperfectly understood, but without doubt as time goes on, much more will be known about it and all the modern conceptions of the structure of matter are going to exert a tremendous influence on all

kinds of chemistry. There will be no exception to this. It is going to be applicable to textile matter. Just when that is going to happen I don't, of course, venture to predict.

FIFTY-FIFTH COUNCIL MEETING

THE Fifty-fifth Council Meeting was held in the Biltmore Hotel, Providence, R. I., Friday afternoon, December 6.

The following members were in attendance: E. H. Killheffer, W. S. Williams, Joseph F. X. Harold, L. A. Olney, W. M. Scott, R. F. Culver, W. R. Moorhouse, H. Christison, G. A. Moran, Walter C. Durfee, W. H. Cady, John Hutton, Charles E. Mullin and W. E. Hadley.

The following applicants were elected to membership:

Active Members

Atack, Dr. F. W., consulting chemist, Mulsoid Products Corporation, Ogdensburg, N. Y. Address: Kingston, Ontario.

Bashlow, Harry I., silk dyer, Clark Thread Company, Bloomfield, N. J. Address: 201 Park Avenue, Passaic, N. J.

Beane, Allison F., dyer, Judson Mills Company. Address: Stagg Apartment, Greenville, S. C.

Bishop, Oakley M., chief, vat dye division, E. I. du Pont de Nemours & Co., Wilmington, Del.

Bosland, Herman S., chemist, Stein, Hall & Co., Inc., 285 Madison Avenue, New York, N. Y.

Carleton, Paul W., research chemist, E. I. du Pont de Nemours & Co., Wilmington, Del. Address: 307 State Street, Penn's Grove, N. J.

Cottrell, Sylvester V., demonstrator and salesman, National Aniline & Chemical Company, 357 West Erie Street, Chicago, Ill.

Driscoll, Thomas H., salesman, Ricco Company, 217 Canal Street, Providence, R. I.

Fackler, Louis K., chief chemist, Stein, Hall & Co., 285 Madison Avenue, New York, N. Y.

Feindel, George P., chemist, Union Bleachery, Box 598, Greenville, S. C.

Gow, Robert, Jr., technical man and salesman, H. A. Metz & Co., New York, N. Y. Address: 4324 South 37th Street, St. Louis, Mo.

Hardman, David C., colorist, John Farmer Company, Lancaster, Pa. Address: 559 West Chestnut Street, Lancaster, Pa.

Hempel, Eric F., dyer, National Knitting Company, 905 Clinton Street, Milwaukee, Wis.

Hitch, Emmet F., research chemist, E. I. du Pont de Nemours & Co., Box 525, Wilmington, Del.

Ledgett, Richard B., colorist, Lyons Piece Dye Works, Paterson, N. J. Address: 175 Bloomfield Avenue, Passaic, N. J.

Linberg, Henry G., colorist and dyer, Newport Chemical Works, Inc., Passaic, N. J.

Markle, Gordon M., salesman and demonstrator, E. I. du Pont de Nemours & Co., Room 1114, 7 Dearborn Street, Chicago, Ill.

Marnoch, William S., dyer, Pacific Mills, Lyman Division, Box 365, Lyman, S. C.

Moorhouse, Courtney E., superintendent of printing, Superior Piece Dye Works, Long Island City, N. Y. Address: 2579 45th Street, Astoria, L. I., N. Y.

Moran, Philip, dyer, Bradford Dyeing Association, Bradford, R. I. Address: 24 William Street Westerly, R. I.

Pierce, Edw. W., demonstrator, Ciba Company, 134 Cedar Street, New York, N. Y.

Selisch, M. A. R., superintendent of dyeing, Thread Mills Company, Box 251, Monticello, Ind.

Waffenschmidt, Henry, demonstrator and salesman, National Aniline & Chemical Company, 3306 Arrow Avenue, Cincinnati, Ohio.

Williams, S. H., demonstrator, General Dyestuff Corporation, Charlotte, N. C.

Junior Members

Amick, Chester A., research chemist, Pacific Mills, 78 East Haverhill Street, Lawrence, Mass.

Appeltofft, Ossian, colorist, General Dyestuff Corporation, New York, N. Y. Address: 148 Sterling Place, Brooklyn, N. Y.

Hurd, Ira Swain, student, Lowell Textile School, Lowell, Mass. Address: 47 Hamilton Avenue, Haverhill, Mass.

Sobocinski, Anton, Jr., student, Philadelphia Textile School, Philadelphia, Pa. Address: Clifton Heights, Pa.

Wolstenholme, S. G., Jr., color mixer, American Embossing & Dye Corporation, New York, N. Y. Address: 35 East First Street, Clifton, N. J.

Associate Members

Christ, Frank, salesman, Newport Chemical Works, 135 Park Avenue, Passaic, N. J.

Bleezarde, Walter L., salesman, Newport Chemical Works, Passaic, N. J. Address: 26 Kenter Place, Allwood, Clifton, N. J.

Corporate Member

Pacific Mills, Lawrence, Mass. E. D. Walen, agent, worsted division, to serve as representative.

The committee on prize awards for best papers published in the Proceedings during the past year reported in accordance with the following tabulation, and their recommendations were approved by the Council:

First prize, $100: Awarded to Carl Z. Draves, of

E. I. du Pont de Nemours & Co.—"The Use of the Spectrophotometer in the Dyestuff Industry."

Second prize, $75: Awarded to Prof. A. H. Grimshaw, of the North Carolina State College Textile School—"Methods of Testing Sulphonated Castor Oil for Determination of Fatty Content."

Third prize, $50: Awarded to John F. Warner, of the Pacific Mills—"Some Methods of Handling Cotton and Rayon Piece Goods."

Fourth prize, $25: Awarded to Prof. E. R. Schwarz, of the Massachusetts Institute of Technology—"Practical Textile Microscopy."

The Secretary's report of the previous meeting was read and accepted.

The Treasurer's report was read and accepted.

The committee designated to proceed with the incorporation of the Association reported progress, and the committee was to continue with power to act and will report at the next meeting.

The Treasurer drew attention to the fact that a relatively small amount of interest was being obtained from the moneys held in the General Fund, and that if this money could be placed under somewhat different conditions the interest could be nearly doubled. Considerable discussion occurred in regard to this matter, as to the manner in which this matter should be handled—i. e., whether bonds should be purchased, the money put into a savings account or placed in a trust company. A motion was finally carried that money be placed in the savings department of a trust company, and that the company be chosen which gives the best interest returns, and that the selection of such trust company be left with the Treasurer.

The committee on the correlation of the Secretary's and Treasurer's offices is to be continued and the report rendered at a later date.

It was decided that the next Council and Research Committee meeting be held in Boston on January 18, 1929.

The meeting was then adjourned.

W. E. HADLEY, *Secretary.*

Applicants for Membership

Active Membership

Betsch, George, boss dyer, Superior Piece Dye Works, Fort Lee, N. J. Sponsors: E. J. Portner and J. C. Zwaan.

Carothers, J. N., director of research, Federal Phosphorus Company, Anniston, Ala. Sponsors: C. E. Mullin and T. J. Nuckolls.

Ginter, Karl, superintendent of dyeing, Industrial Dyeing Corporation of North Carolina, Charlotte, N. C. Sponsors: D. S. Moss and T. J. Nuckolls.

Hopwood, James A., dyer, Bradford Dyeing Association, Westerly, R. I. Sponsors: J. A. Pawson and Raymond Curtis.

Keach, William W., demonstrator, E. I. du Pont de Nemours & Co., Providence, R. I. Sponsors: I. L. Sheldon, Jr., and Charles H. Stott.

Ludwig, Henry L., color chemist, R. H. Schleicher & Co., Inc., New York, N. Y. Sponsors: S. Klein and D. P. Knowland.

Roberts, Thomas H., manufacturing chemist, Arnold, Hoffman & Co., Inc., Providence, R. I. Sponsors: W. S. Williams and R. F. Culver.

Schaeffer, J. G., technical and textile representative, J. B. Ford Company, Wyandotte, Mich. Sponsors: Charles H. Stone and T. J. Nuckolls.

Tattersall, Fred, superintendent of printing, U. S. Finishing Company, Providence, R. I. Sponsors: R. Haworth and George A. Sweet, 2nd.

Junior Membership

Herschberg, Henry P., assistant manager, Imperial Printing & Finishing Company, Bellefonte, R. I. Sponsors: R. S. MacDougall and R. F. Culver.

ASSOCIATION BADGES

The lapel button badge illustrated herewith is worn by members of the American Association of Textile Chemists and Colorists.

The three "rings" are enameled in red, yellow and blue, respectively, and the initials and border are brought out in gold. The general effect is exceedingly attractive.

Badges may be secured at $1.50 each by addressing the Secretary.

WALTER E. HADLEY,
5 Mountain Avenue,
Maplewood, N. J.

AMERICAN
DYESTUFF REPORTER

Devoted to the use and application of dyestuffs and the mechanical equipment incidental thereto.

LOUIS A. OLNEY
PROFESSOR OF CHEMISTRY AND DYEING, LOWELL TEXTILE SCHOOL
Directing Editor

CLAYTON HOAGLAND
Managing Editor

MYRON DREW REESER
Advertising Manager

Published biweekly by
HOWES PUBLISHING CO., INC.
90 William Street, New York City

A. P. HOWES, *President* E. S. PREDMORE, *Secretary*

Subscription price $5.00 per year: Canadian $5.50; foreign $6.00

Vol. XVII December 24, 1928 No. 22

THE ANNUAL MEETING

ALMOST every trade or professional association likes to boast now and then of its size and growth. There are sound reasons, certainly, why an association should expand steadily: A large membership increases its prestige and importance in the trade or industry that it represents; it adds to it a certain strength that is very essential when there is big work to be done; it lessens the *per capita* cost of operating the association, makes it financially more powerful; and it spreads the benefits of the association among a greater majority of those who need those benefits.

But there is apparently one disadvantage that comes with the growth of a body like the American Association of Textile Chemists and Colorists. Regardless of its size, only a certain number of members seem to be able to attend its annual meetings—between three and five hundred, this attendance being related in some degree to the convenience of the city where the meeting is held. That is regrettable because every one of the annual meetings has been extremely important in many ways, important both to the Association as a whole and to its individual members. And nearly 700, or more than one-half of those members, were for one reason or another absent from the Providence meeting held two weeks ago—probably more than were absent from previous meetings, for the reason that the membership has grown so rapidly in the past two years.

From the published reports in the Proceedings those who could not be in Providence may garner at their leisure what instruction and inspiration they will, although they did miss the intangible benefits of lively social intercourse among a group of professional men in their industry. It is earnestly to be hoped, nevertheless, that as the real value of these annual meetings becomes more widely appreciated among the members, many more mills will see to it that their chemists and foreman dyers attend. Even if the mill shares the expenses of the man they send to the meeting, it eventually profits—and the man himself profits, too. There can hardly be a loss.

A large and active gathering of textile chemists, dyers, and other mill and dyestuff men such as that just staged in Providence has for its aim much more than the reading of technical papers and the entertainment of the members. This should be obvious to every one. The technical programs do form the meat of the meeting, it is true, and they are undoubtedly improved by such excellent entertainment as the annual dinner, for example, affords. But one of the main functions of the meeting is to bring emphatically to the attention of all members of the A.A.T.C.C. and of others interested, the projects, plans and accomplishments of the Research Committee.

Most of this committee's work is of such nature that progress is not apparent to the casual observer. That progress must be told in reports and plainly shown by graph and chart and by demonstration of new testing equipment like the Launder-Ometer. Only in this way can some idea of the association's research work be vividly and concretely presented to its members. Only in this way can proof be displayed of definite progress from year to year.

If research projects of such remarkable value to the textile industry are not only to be appreciated and recognized but also to be *supported* financially, they must first be understood by the members of the association. Some real enthusiasm must be injected into the membership body before the faintest spark of enthusiasm can be ignited in the industry where it will do most good. The annual meetings of the A.A.T.C.C. have become one of the best means of stirring up that enthusiasm and in this one respect the meeting held at Providence should exert a far-reaching influence upon the advancement of technical research on textiles in this country.

PROMOTED

THE textile division of the United States Bureau of Standards will be directed by a new chief after January 1. His name is William D. Appel and he is known to most members of the American Association of Textile Chemists and Colorists as the energetic research worker on dyes at the Bureau whose assistance in the fastness tests carried on by the association has been of such incalculable value.

Mr. Appel has been a very active member of the Research Committee of the A.A.T.C.C. almost from the organization of that group. He has, owing to his capacity in the Bureau, been able to employ its laboratory facilities in advancing the fastness standardization work of the committee, not only by carry-

ing out light exposure tests but also in developing, with other members, the Launder-Ometer now used for the association's washing tests. He has been able, we say, but that phrase gives no hint of the willingness and the industry that Mr. Appel brought to these painstaking research studies. When the association appointed its own research assistant he entered the Bureau of Standards laboratories to work under Mr. Appel's guidance.

In his new job as chief of the Textile Division, Mr. Appel will obviously be a much busier man, for his duties will encompass for more than when he directed the dye research. While under the circumstances the A. A. T. C. C. cannot in fairness hope to benefit from his unflagging personal interest in its work to the same extent as before, nevertheless, it is reassuring to know that his promotion is not taking him out of the Bureau of Standards. The REPORTER feels that he is headed for even more noteworthy work in his new capacity and wishes him every success.

BRITISH STORES GO IN FOR TESTING

TWO of the largest and most progressive department stores in England have installed analytical and testing laboratories to pass on textiles and other merchandise before it is bought and put on sale. J. G. Williams, in charge of one of these laboratories, in an address reported in the Women's Wear Daily urging the establishment of some kind of consumers' or 'distributive trades' research association, said:

"Much of the work done by the research association of the cotton, wool, silk linen and rubber industries is concerned with manufacturing problems, but there are also facts uncovered of the greatest interest to the consumer. Such facts do not generally get to the buyer of department stores, do not get published in the daily press, and so do not prove of benefit to us. The development of research for consumers may come with time.

"There are items of merchandise which tests at once show will inevitably give grounds for serious dissatisfaction when used by the normal person with normal care. This percentage of products is low, probably less than 5 per cent, but the fact that most people are fortunate is not a great consolation to the customer who is bitterly disappointed with the service given by a purchase."

A solution of the problem in England as in this country is believed to lie in the establishment of testing laboratories, either by the consumers themselves when grouped in associations or by the stores. But a central research bureau representing not only the retail stores but also the maintenance groups, such as the laundries and dry-cleaners, and the converters and the textile mills, is clearly the most intelligent means through which to standardize such materials as apparel.

EXTRACTORIALS

The business structure is under piercing scrutiny every day. Not the scrutiny of muckrakers. That doesn't hurt as much as the scrutiny and criticism of potential competitors who have the courage to say, "That's wrong. I'm going to do it the right way."—*William Feather, in Nation's Business.*

It is almost impossible to exaggerate the value to research in industry, for research furnishes the inspiration of intellect that industry transmutes into the progress of practicality. Our industry needs more and better research!—*Advertisement of the Woolen Corporation of America.*

What is needed today and will continue to be needed is the thinking machine. The loom or spinning machine cannot think; the human trained to that machine can only think to the limit of the mechanical contrivance; but what makes the mill efficient, and the business prosperous, is the human machine that thinks of other details of the work than the machine in sight.—*The Textile Review.*

Money that is educated; money that is accustomed to distinguish between a day dream and the real vision that can be logically supported; money that is content to build slowly and constructively, looking for its return five or ten years ahead—this is a prime necessity. There is enough money in almost any country to establish chemical industry, but there may very frequently be a shortage of this educated money.—*John E. Teeple, in Industrial and Engineering Chemistry.*

A business is a cumbersome organism. It gets up momentum slowly and once it gets going it is difficult to change its direction. The fundamental idea in running a business is to find out thoroughly just what you want it to do, put the effort behind it to make it do this, and then spend your time in seeing that the work is properly done. —*George A. Prochazka, Jr., in Chemical and Metallurgical Engineering.*

A number of the larger units in the textile industry have for a number of years been employing chemical experts or organizing departments of scientific research to guide them in making economies in manufacturing as well as the development of new and attractive finishes. Not only this, but there are units in our industry which have for several years employed scientific departments organized and operated by themselves. Expenditures toward these ends have already been great, but they have brought more than compensating results.—*Lincoln Baylies, President of National Association of Cotton Manufacturers.*

BLEACHING, DYEING AND FINISHING, MODERNIZED

(*Concluded from page* 808)

of the compensating roll "C" under which the cloth passes from the drying cans to the tenter chain proper. If the operator presses the fast button on the control panel, the pilot motor on the 20-horsepower motor is actuated, causing a corresponding increase in the speed of the tenter chain. As soon as the speed of the cloth increases, it lifts up the compensating roll "C" to a new position and the change in position causes the shifting cable "D" which is mechanically connected by means of sprockets, to the shifting brushes on the 7½-horsepower motor. The speed of this motor increases exactly the same amount as the 20-horsepower motor increased. In this manner the speeds of the starch mangle, drying cans and tender chain are always uniformly maintained.

The blower fan motor shown in "C" of Fig. 8 is a 10-horsepower, squirrel-cage type and is used to circulate the hot air in the tenter housing.

The final operation in the actual finishing of piece goods is that of calendering. A six roll plain and chasing hydraulic calender is shown in Fig. 9. It is driven by a 20-horsepower, high-reactance, squirrel-cage motor "A" which drives through the gears, "B" and "C", to the clutch "D" by which the machine is controled. This operation consists of passing the cloth through the cotton and steel rolls with or without heat, depending on the amount of lustre desired on the cloth.

The calender is equipped with a winder. This rolls the cloth up so that it will be ready for the subsequent operations—folding, doubling and rolling or to the garment cutting tables.

Undoubtedly one of the prime factors in the entire range of processes is that of absolute control of the motive power and also a control that can be conveniently operated at several different locations if necessary. This direct driven, button control method involves practically no physical effort on the part of the operator, and he can then concentrate his attention on the actual run of the goods.

Recognizing the advantages accruing to manufacturers, converters and printers of costume silks through registration of designs with the Design Registration Bureau of the Silk Association of America, Inc., the silk section of the National Association of Finishers of Cotton Fabrics at a recent meeting pledged itself to co-operate with the work of the Design Bureau. A resolution was adopted in which it was stated that the silk section of the National Association of Finishers of Cotton Fabrics indorses the work of the Design Registration Bureau in its attempt to maintain a high standard of ethics in the printed silk industry.

WEIGHTING MARGIN SET BY SILK ASSOCIATION

One definite step toward more intelligent control of silk weighting within scientifically correct limits was taken last week by the Silk Association when its committee assigned to the problem laid down a weighting margin of 7 per cent. This margin represents the leeway above the maximum limits for weighting silk piece goods and it becomes effective January 15.

Originally the committee planned to make it 5 per cent. When its preliminary report, with that figure, became public, there were some dyers who thought it could be made 10 per cent. A compromise was reached, making it 7. Throughout the industry it is felt that 7 per cent is a safe margin and that dyers who understand their business will have no difficulty in keeping within that figure.

The schedule of maximum weight limit is:

Satins, 50 per cent.

Crepe de Chine and Canton crepes, 45 per cent.

Georgettes, 30 per cent.

Chiffons, 10 per cent.

Fabrics for printing, 30 per cent.

SPRING COLOR CARD ISSUED

Cameo Tints and Blues Are Featured

A new general color card covering the standard fashionable shades for the spring of 1929 was distributed last week by the Textile Color Card Association, according to a recent announcement by Margaret Hayden Rorke, managing director of the organization. This spring card contains eighty-four different shades with a group of cameo tints and several novel blues predominating. The colors were selected as usual after conferences with various branches of the textile, shoe and millinery trades.

Eight colors of two shades are included in the group of cameo tints especially featured on the spring card; they have been particularly prepared for sports and evening wear. This group takes its name from the fact that the cameo has two basic shades. This group of colors carries the following names: Blush, Maize, Blue, Citron, Nile, Shell, Mauve and Sky.

In the main body of the card blues are particularly stressed, Mrs. Rorke pointed out. In view of the great interest in aviation, these blues are lighter in tone, reflecting the hues as one looks "into the sky."

A group of four colors has been developed in honor of Commander Byrd and his expedition into the Antarctic. These colors are Horizon Blue, Byrd Blue, Polar Blue and Navigator Blue.

Another smaller group of blues have also been added which are named Blue Smoke, Blue Slate and Blue Steel. Mrs. Rorke also said that in view of the general interest in blues a number of shades had been

repeated, including Lucerne, Bleau de Lyon, Monet, Madeliene.

One new blue has also been added which is called Santander Blue and was named after the place where the Spanish Cup Races are held, off the coast of Spain.

Beiges will also be strong in the spring colors, Mrs. Rorke said, and four categories have been developed. The first includes the yellow bieges such as Cliquot, Golden Beige and Burnt Buff.

NEW INDIGOSOL CARD ON COTTON GOODS

A large number of attractive samples of goods dyed in the jig with Indigosol colors are displayed in a new color card recently published by Durand & Huguenin, S. A. of Basle and distributed in this country by Carbic Color & Chemical Company of New York, sole importers for the Swiss manufacturers.

The card is entitled "Cotton Piece Goods Dyed with Indigosols in the Jigger" and in the form of a folder exhibits fifty swatches in as many different shades of delicate pinks, greens and blues and the darker reds, purples and navy.

The text of the card states that dyeings of good fastness to washing and light on cotton were hitherto generally produced with the aid of vat dyes by way of vatting and re-oxidation of all dyeings. By means of the Indigosols, it is claimed, piece goods may be dyed direct and developed by a simple oxidizing after-treatment.

A circular describing a new addition to the Indigosols has also been distributed. The product is Indigosol Golden Yellow IGK, said to be a water-soluble color which, because of its strong golden-yellow shade, is mainly of interest for calico printing. It may be resisted white or in colors with a Rongalite CL or acetate resist, it is chlorate resisting and may therefore be used in chlorate color discharges. Good fastness properties are claimed for this color.

SOUTHERN DYERS, FINISHERS, MERCERIZERS MEET IN GREENVILLE

A group of some two hundred dyers, bleachers, finishers and mercerizers gathered in Greenville, S. C., last week to attend the December meeting of their division of the Southern Textile Association. One of the principal features of the session was the discussion of a plan to issue diplomas to students using specified textile books and successfully passing the required examinations of the association.

The meeting opened with a luncheon, culminated with a banquet in the evening and comprised several talks by prominent textile men of the section. An address of welcome was made by Capt. W. P. Conyers and a talk given by Dr. D. W. Daniels of Clemson College.

S. O. C. M. A. ELECTS OFFICERS AT ANNUAL MEETING

The seventh annual meeting of the Synthetic Organic Chemical Manufacturers Association was held on Friday, December 14, at the Hotel Commodore, New York City. The executive meeting of the association was held in the morning, at which the following officers were elected for the coming year: President, August Merz (re-elected); treasurer, Albert J. Farmer, Vice-Presidents: Ralph E. Dorland (re-elected), W. F. Harrington (re-elected), E. H. Killheffer (re-elected) and A. Cressy Morrison.

Board of Governors: E. A. Barnett, John Campbell & Co., New York City; J. W. Boyer, Monsanto Chemical Works, New York City; A. S. Burdick, Abbott Laboratories, North Chicago, Ill.; R. W. Cornelison, Peerless Color Company, Plainfield, N. J.; Ralph E. Dorland, Dow Chemical Company, New York City; A. J. Farmer, Pharma-Chemical Corp., N. Y. City; W. F. Harrington, E. I. duPont, Del.; Glenn Haskel, U. S. Industrial Chemical Company, New York City; E. H. Killheffer, Newport Chemical Works, Passaic, N. J.; E. H. Klipstein, E. C. Klipstein & Co., New York City; August Merz, Heller & Merz Co., New York City; A. Cressy Morrison, Carbide & Carbon Chemicals Corp., N. Y. City; Wm. S. Weeks, Calco Chemical Co., Bound Brook, N. J.; S. W. Wilder, Merrimac Chemical Company, Boston, Mass., and F. G. Zinsser, Zinsser & Co., Hastings-on-Hudson, N. Y.

The rate for "Position Wanted" advertisements in this column is 2 cents a word—with a minimum of 50 cents per insertion. For all other types of advertisements—i. e., help wanted, machinery or supplies for sale—the rate is $5.00 per column inch or less per insertion.

AVAILABLE IMMEDIATELY

Available immediately as dyer or chemist. Extensive experience with vat colors on all types of fabrics, also rayon and mixtures. Experienced in analyses, chemical control, and experimental and development work. Address: Classified Box 489, American Dyestuff Reporter.

WANTED

Colorist in dyehouse laboratory located in Maryland, young man of good training; experience not essential. Replies, giving full particulars, age, training, experience and salary required should be addressed to Classified Box 495, American Dyestuff Reporter.

HOSIERY DYER

Hosiery dyer desires a position. Can dye all classes of hosiery. Address: Classified Box 496, American Dyestuff Reporter.